N42237.AR.000312
NSB KINGS BAY
5090.3a

TECHNICAL MEMORANDUM APRIL 1994 GROUNDWATER SAMPLING EVENT SITE 11
NSB KINGS BAY GA
9/1/1994
ABB ENVIRONMENTAL

TECHNICAL MEMORANDUM
APRIL 1994 GROUNDWATER SAMPLING EVENT
SITE 11, OLD CAMDEN COUNTY LANDFILL

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

UNIT IDENTIFICATION NO. N42237
CLEAN - DISTRICT I
CONTRACT NO. N62467-89-D-0317

SEPTEMBER 1994

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
29419-9010

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION unclassified	1b. RESTRICTIVE MARKINGS N/A
2a. SECURITY CLASSIFICATION AUTHORITY N/A	3. DISTRIBUTION/AVAILABILITY OF REPORT N/A
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION ABB Environmental Services, Inc.	6b. OFFICE SYMBOL (*if applicable*) ABB-ES
7a. NAME OF MONITORING ORGANIZATION Naval Submarine Base, Georgia	
6c. ADDRESS (*City, State, and ZIP Code*) 2590 Executive Center Circle, East Tallahassee, Florida 32301	7b. ADDRESS (*City, State, and ZIP Code*) Public Works Department NSB, Code N561 Kings Bay, Georgia 31547
8a. NAME OF FUNDING/SPONSORING ORGANIZATION SOUTHNAVFACENGCOM	8b. OFFICE SYMBOL (*if applicable*) N/A
9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N62467-89-D-0317	
8c. ADDRESS (*City, State, and ZIP Code*) 2155 Eagle Drive P.O. Box 10068 North Charleston, SC 29411-0068	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.
11. TITLE (*Include Security Classification*) (Unclassified) Technical Memorandum, April 1994 Groundwater Sampling Event, Site 11, Old Camden County Landfill, Naval Submarine Base, Kings Bay, Georgia	
12. PERSONAL AUTHOR(S) Laura Harris	
13a. TYPE OF REPORT Final	13b. TIME COVERED FROM 04/94 TO 06/94
14. DATE OF REPORT (*Year, Month, Day*) September 1994	15. PAGE COUNT 82
16. SUPPLEMENTARY NOTATION	
17. COSAT: CODES FIELD / GROUP / SUB-GROUP	18. SUBJECT TERMS (*Continue on reverse if necessary and identify by block number*) Groundwater Monitoring
19. ABSTRACT (*Continue on reverse if necessary and identify by block number*) See "Block No. 19, Abstract" on the back of this page.	
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ Unclassified/Unlimited ☒ Same as RPT ☐ DTIC Users	21. ABSTRACT SECURITY CLASSIFICATION unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Mr. Anthony Robinson	22b. TELEPHONE (*Include Area Code*) (803) 743-0339 / 22c. OFFICE SYMBOL 182

DD FORM 1473, JUN 86 *Previous editions are obsolete*
S/N 0102-LF-014-6603

REPORT DOCUMENTATION PAGE--continued

Form Approved
OMB No. 0704-0188

Block No. 18, Subject Terms

Block No. 19, Abstract

In October and November 1993 drilling, monitoring well installation, and subsurface soil sampling activities were conducted as part of the Supplemental Resource and Recovery Act Facility Investigation (RFI) at Site 11, Old Camden County Landfill, at Naval Submarine Base, Kings Bay, Georgia. These activities were conducted in and around the landfill and in Crooked River Plantation Subdivision. In January 1994 groundwater samples were collected from the 25 monitoring wells installed as part of the Supplemental RFI and from 10 existing wells that were installed during investigations conducted in 1992. Results of the 1993 field investigation and the January 1994 groundwater sampling event are reported separately in the Technical Memorandum, 1993 Field Program and January 1994 Groundwater Sampling Event for Site 11, Old Camden County Landfill (ABB Environmental Services, 1994).

This report summarizes results of chemical analyses performed on groundwater samples collected in April 1994. Thirty-nine groundwater samples were collected from 35 monitoring wells located in and around Site 11 and in Crooked River Plantation Subdivision. The analytical data for these groundwater samples were compared to corresponding analytical data for groundwater samples collected during January 1994. The two data sets are generally consistent.

ASEA BROWN BOVERI

The geologic work and professional opinions rendered in this Technical Memorandum, April 1994 Groundwater Sampling Event, Site 11, Old Camden County Landfill, Naval Submarine Base, Kings Bay, Georgia, were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice.

Laura B. Harris

Professional Geologist No. 1063
Expires December 31, 1995

ABB Environmental Services, Inc.

1400 Centerpoint Blvd.
Suite 158
Knoxville, Tennessee 37932-1968

Telephone
(615) 531-1922

Fax
(615) 531-8226

DISTRIBUTION

Southern Division, Naval Facilities Engineering Command	3
Naval Submarine Base, Kings Bay, Georgia	15

TECHNICAL MEMORANDUM
APRIL 1994 GROUNDWATER SAMPLING EVENT
SITE 11, OLD CAMDEN COUNTY LANDFILL

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

Unit Identification Code No. N42237
Contract Task Order No. 094
Contract No. N62467-89-D-0317

Prepared by:

ABB Environmental Services, Inc.
2590 Executive Center Circle, East
Tallahassee, Florida 32301

Prepared for:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29418

Anthony Robinson, Code 18511, Engineer-In-Charge

September 1994

FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by today's standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense (DOD) initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). The acts, passed by Congress in 1980 and 1986, respectively, established the means to assess and cleanup hazardous waste sites for both private sector and Federal facilities. These acts are the basis for what is commonly known as the Superfund program.

A second program to address present hazardous materials management is the Resource Conservation and Recovery Act (RCRA) Corrective Action Program. This program is designed to identify and cleanup releases of hazardous substances at RCRA-permitted facilities. RCRA is the law that requires solid and hazardous wastes to be managed in an environmentally sound manner. The law applies primarily to facilities that generate or handle hazardous waste.

The investigations at Naval Submarine Base (NSB), Kings Bay, Georgia, are being conducted under the RCRA Corrective Action Program. The Georgia Department of Natural Resources, Environmental Protection Division, oversees the program at the NSB.

The RCRA Corrective Action Program includes the following stages:

- The RCRA Facility Assessment (RFA) and confirmatory sampling identify solid waste management units, evaluate the potential for releases of contaminants, and determine the need for future investigations.

- The RCRA Facility Investigation (RFI) then determines the nature, extent, and fate of contaminant releases.

- Interim Measures are implemented when necessary to control further migration or release of contaminants.

- The Corrective Measures Study identifies and recommends measures for achieving long-term remedial action goals.

Questions regarding the RCRA program at NSB Kings Bay should be addressed to the Public Affairs Office at (912) 673-4714.

EXECUTIVE SUMMARY

Under contract to the U.S. Department of the Navy (Navy), Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), this Technical Memorandum was prepared for Site 11, Old Camden County Landfill, located on the Naval Submarine Base (NSB) in Kings Bay, Georgia. This Technical Memorandum was prepared under the Comprehensive Long-term Environmental Action, Navy (CLEAN) Contract No. N62467-89-D-0317, Contract Task Order No. 094.

Previous investigations at Site 11, Old Camden County Landfill, indicated that a release of volatile organic compounds had occurred. A Supplemental Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) program has been developed to support both an Interim Measure and development of a site-specific Corrective Action Plan, to collect data to support a Health and Environmental Assessment, and to fully characterize potentially contaminated media. In August 1994, a technical memorandum was submitted to the Navy that addressed drilling soil borings, collecting subsurface soil samples for chemical analyses, installing monitoring wells, and collecting a round of groundwater samples for chemical analyses (ABB Environmental Services, Inc. [ABB-ES], 1994a). This second technical memorandum for the Supplemental RFI serves as a transmittal of analytical data for the second groundwater sampling event that was conducted in April 1994.

Thirty-nine groundwater samples were collected from 35 groundwater monitoring wells located in and around Site 11 and in Crooked River Plantation Subdivision. The analytical data for these groundwater samples were compared to corresponding analytical data for groundwater samples collected during January 1994. The two data sets are generally consistent.

TABLE OF CONTENTS

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

LIST OF FIGURES

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

LIST OF TABLES

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
BHC	benzene hexachloride
BTOC	below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
DQO	data quality objective
DOD	Department of Defense (Federal)
EPD	Environmental Protection Division
IAS	Initial Assessment Study
IR	Installation Restoration
J	estimated value
$\mu g/\ell$	micrograms per liter
MCL	maximum contaminant level
mlw	mean low water
NACIP	Navy Assessment and Control of Installation Pollutants
Navy	U.S. Department of the Navy
ND	not detected
NJ	presumptive evidence for the presence of a compound at an estimated concentration
NSB	Naval Submarine Base
PA	Preliminary Assessment
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation and Feasibility Study
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SVOC	semivolatile organic compound
TAL	target analyte list
TCL	target compound list
TOC	top of casing
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

Under contract to the U.S. Department of the Navy (Navy), Southern Division, Naval Facilities Engineering Command, this Technical Memorandum was prepared for Site 11, Old Camden County Landfill, located on the Naval Submarine Base (NSB) in Kings Bay, Georgia. This Technical Memorandum was prepared under the Comprehensive Long-term Environmental Action, Navy Contract No. N62467-89-D-0317, Contract Task Order No. 094.

The groundwater sampling event discussed in this Technical Memorandum is the second sampling event associated with a Supplemental Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) being conducted at Site 11. Activities associated with the Supplemental RFI are described in the Supplemental RFI Workplan (ABB Environmental Services, Inc. [ABB-ES], 1994b) and Sampling and Analysis Plan (SAP) (ABB-ES, 1994c). These planning documents for the Supplemental RFI included two groundwater sampling events. Two additional sampling events have been tentatively planned for September 1994 and April 1995.

This Technical Memorandum serves as a transmittal of analytical data associated with the groundwater sampling event conducted in April 1994 at Site 11, Old Camden County Landfill. In addition to the analytical data, a water-table surface map and a potentiometric surface map are also presented and groundwater flow is briefly discussed.

A technical memorandum was submitted to the Navy in August 1994 (ABB-ES, 1994a) that addressed the field effort conducted in October and November 1993 and the January 1994 groundwater sampling event. This Technical Memorandum indicated soil sorptive capacity test data would be submitted in this technical memorandum. However, the data are not presented in this technical memorandum because of delays at the laboratory. The sorptive data will be presented in the Supplemental RFI Report where it will be appropriately incorporated into evaluations and interpretations regarding conditions at the site.

The remainder of this chapter provides an overview of the sampling and analytical programs associated with the April 1994 groundwater sampling event. Groundwater samples and associated quality assurance and quality control samples were collected in accordance with procedures outlined in the Quality Assurance Project Plan contained in the Supplemental RFI SAP (ABB-ES, 1994c). The Technical Memorandum addressing the January 1994 groundwater sampling event, submitted in August 1994 (ABB-ES, 1994a), provided information regarding sample collection and analytical procedures. These procedures are included only by reference.

Groundwater samples were collected from 35 monitoring wells located in and around the landfill (Site 11) and in Crooked River Plantation Subdivision (Figure 1-1). Sampling was conducted from April 4 to 9, 1994. A total of 39 groundwater samples, including 4 duplicate groundwater samples, were collected. Groundwater samples were submitted to a contract laboratory for analysis. The analytical program included Contract Laboratory Program (CLP) analyses for Target Compound List (TCL) organic analytes (U.S. Environmental Protection Agency [USEPA], 1992) and Target Analyte List (TAL) inorganic analytes (USEPA, 1991a). CLP analyses were performed for groundwater samples from 32 of the monitoring wells. Groundwater samples from the other 3 monitoring wells, KBA-11-11B, KBA-11-13A, and KBA-11-16, were submitted for analyses of constituents included in Title 40, Code of

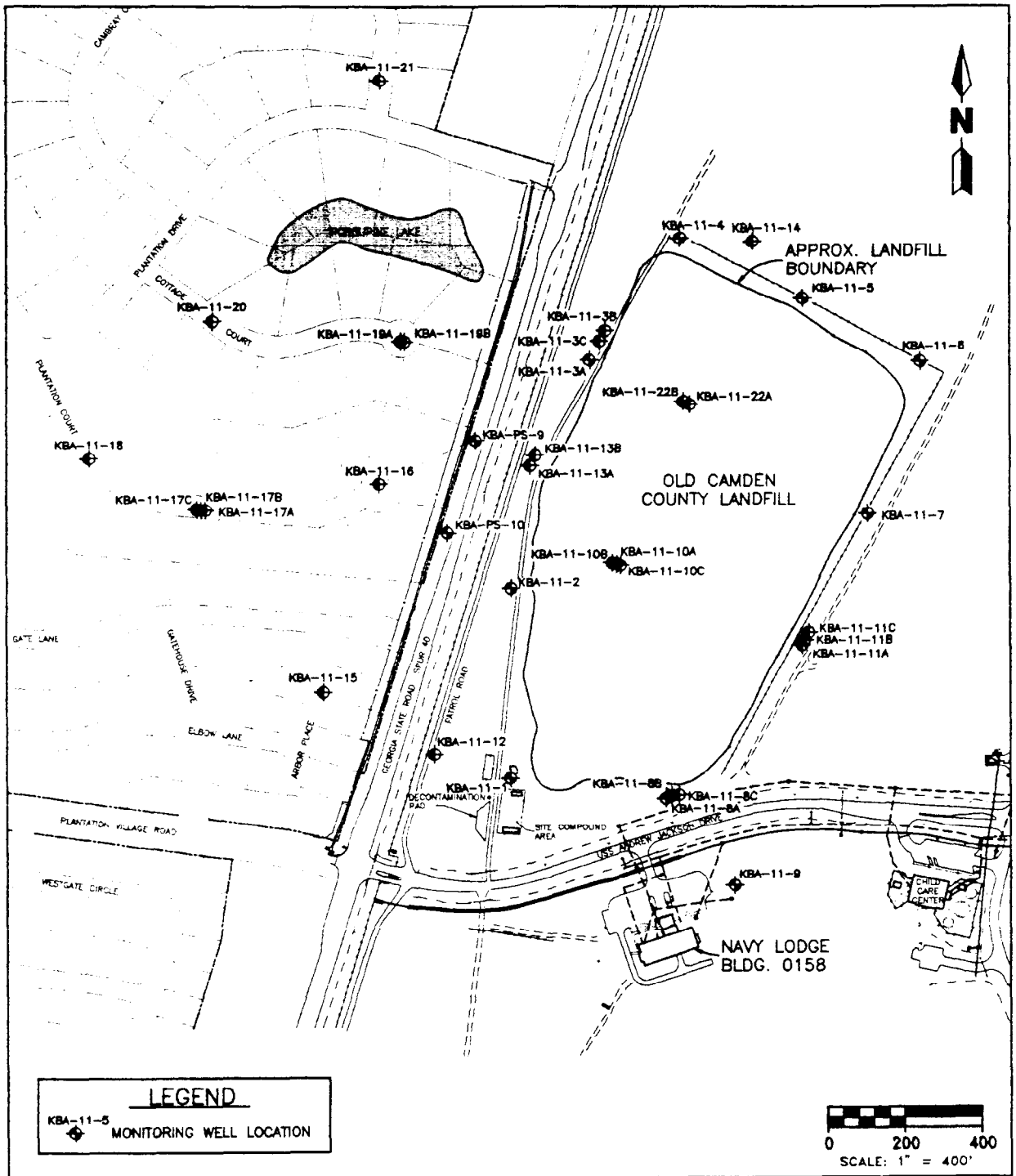

FIGURE 1-1

MONITORING WELL LOCATIONS

TECHNICAL MEMORANDUM FOR APRIL 1994 GROUNDWATER SAMPLING EVENT

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB\08503-48\4-94_GWS\FIG_1-1\DMF\940630

Federal Regulations (CFR), Part 264 (40 CFR 264), Appendix IX groundwater monitoring list.

Subpart F, Releases from Solid Wastes Management Units, of 40 CFR 264, incorporated by reference into the Hazardous Waste Management Rules of the State of Georgia, Department of Natural Resources, Environmental Protection Division (EPD) (Bureau of National Affairs, 1993), requires characterization of constituents listed in Appendix IX of 40 CFR Part 264. This requirement has been addressed at Site 11 by collecting groundwater samples from three monitoring wells and submitting the samples for analyses of Appendix IX constituents. The Appendix IX constituents were analyzed according to analytical methods presented in Test Methods for Evaluating Solid Waste (SW-846) (USEPA, 1986). SW-846 analytical methods are suggested in Appendix IX of 40 CFR 264 for analysis of the constituents listed in Appendix IX. CLP analytical methods are preferred because CLP analyses can achieve a higher level of data quality than SW-846 analytical methods. If the SW-846 analyses for Appendix IX constituents indicate that all contaminants in the groundwater are included in the CLP analyte lists, then CLP analyses should be suitable for groundwater monitoring.

Sulfide, an Appendix IX constituent not included in the CLP, was analyzed in all 39 groundwater samples according to SW-846 methodology. Sulfide was included in the analytical program for all of the groundwater samples because it has been detected in groundwater samples from the site and data are needed to evaluate whether concentrations of this constituent are related to waste disposal.

The laboratory analytical reports were submitted to a data validation contractor for evaluation of technical criteria related to data usability. The data were evaluated following USEPA guidance for organic and inorganic data review (USEPA, 1990; 1988) and draft guidance for pesticide and aroclor data review (USEPA, 1991b). CLP data were evaluated according to USEPA Level IV data quality objectives (DQOs) and SW-846 analytical data were evaluated according to USEPA Level III DQOs.

2.0 GROUNDWATER FLOW

In March 1994 the operation of an Interim Measure groundwater extraction and treatment system was initiated. Two groundwater extraction wells were in operation during March pumping a total of 15 gallons per minute. Pumping from these two wells was stopped on March 30. On April 4, 1994, water-level elevations were measured in each of the 35 monitoring wells. Water-level elevations were measured during a 2-hour period and these data were used to prepare a water-table contour map (Figure 2-1) and a potentiometric surface contour map (Figure 2-2). Water-level elevation data are listed in Table 2-1.

The water-table contour map was prepared using data collected from nine monitoring wells located around the landfill that intercept the surface of the water table. The potentiometric surface contour map was prepared using data collected from monitoring wells screened from approximately 0 feet mean low water (mlw) to 20 feet mlw (about 30 to 50 feet below the water table). The water-table contour map and the potentiometric surface contour map are similar to those previously developed from water-level elevations recorded in January 1994 (ABB-ES, 1994a). The groundwater contours do not indicate residual effects from the operation of the extraction system.

Overall, the groundwater flow directions are consistent with previous interpretations based on water-level elevation data collected in the past. Groundwater flow at the surface of the water table is generally to the northwest. In the southeastern part of the landfill, the contour lines for the water table surface map indicate there may be flow towards the southeast (Figure 2-1). However, the water table is high and reflects nonequilibrium, transient conditions caused by recent heavy rainfall. It is expected that a more uniformly westerly flow will be indicated, as has been depicted in previous reports, when water levels recede. The hydraulic gradient developed from the hydraulic head data from within the 0 to 20 feet mlw interval of the surficial aquifer is generally to the west to northwest. The west to northwest groundwater flow within the 0 to 20 feet mlw interval of the surficial aquifer corresponds to the direction of contaminant migration based on groundwater contamination data.

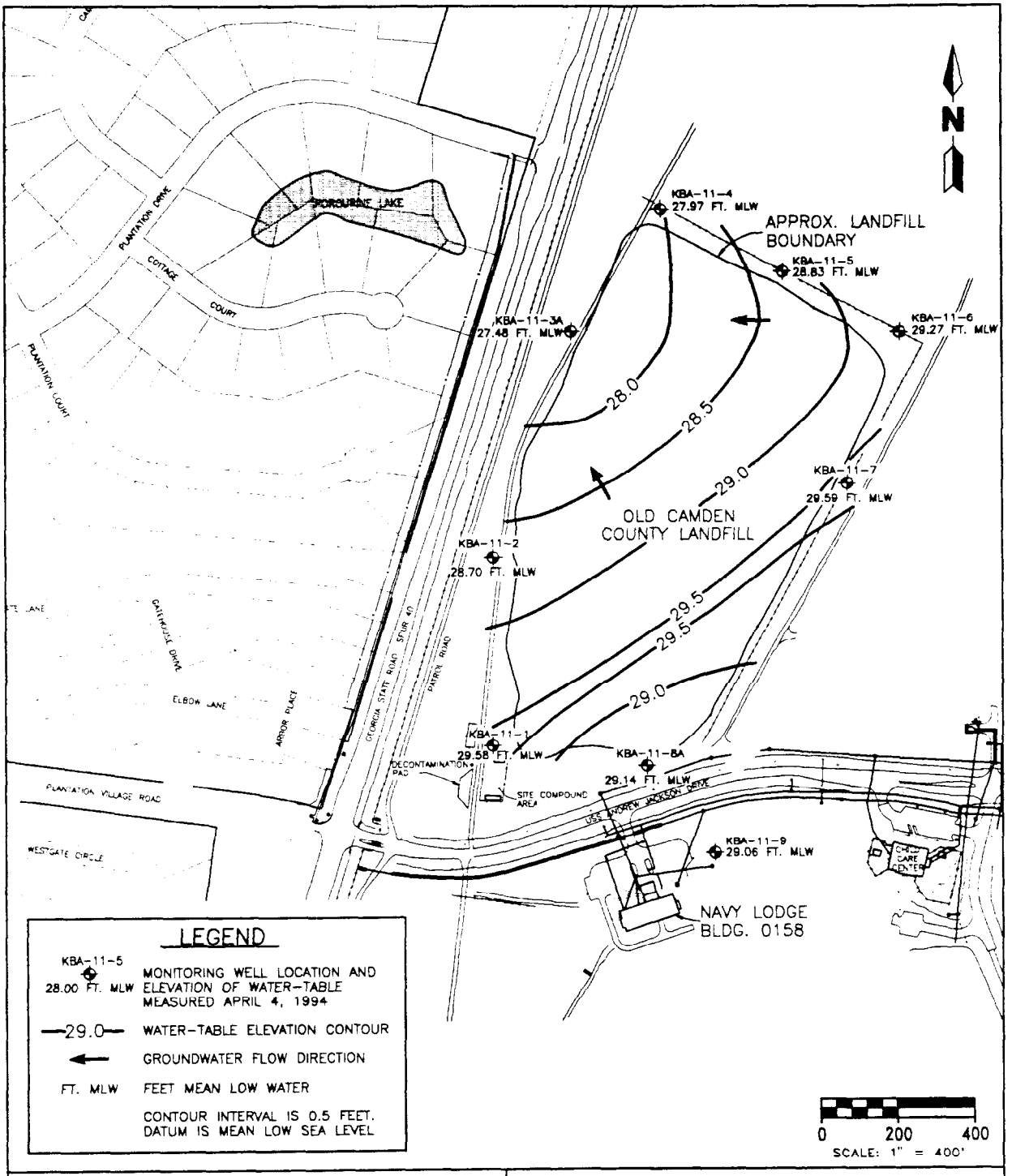

FIGURE 2-1

WATER-TABLE SURFACE MAP

TECHNICAL MEMORANDUM FOR APRIL 1994 GROUNDWATER SAMPLING EVENT

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

D:\DWG\ABB_08503-48_4-94_GWS\FIG_2-1\DMF\940818\940912

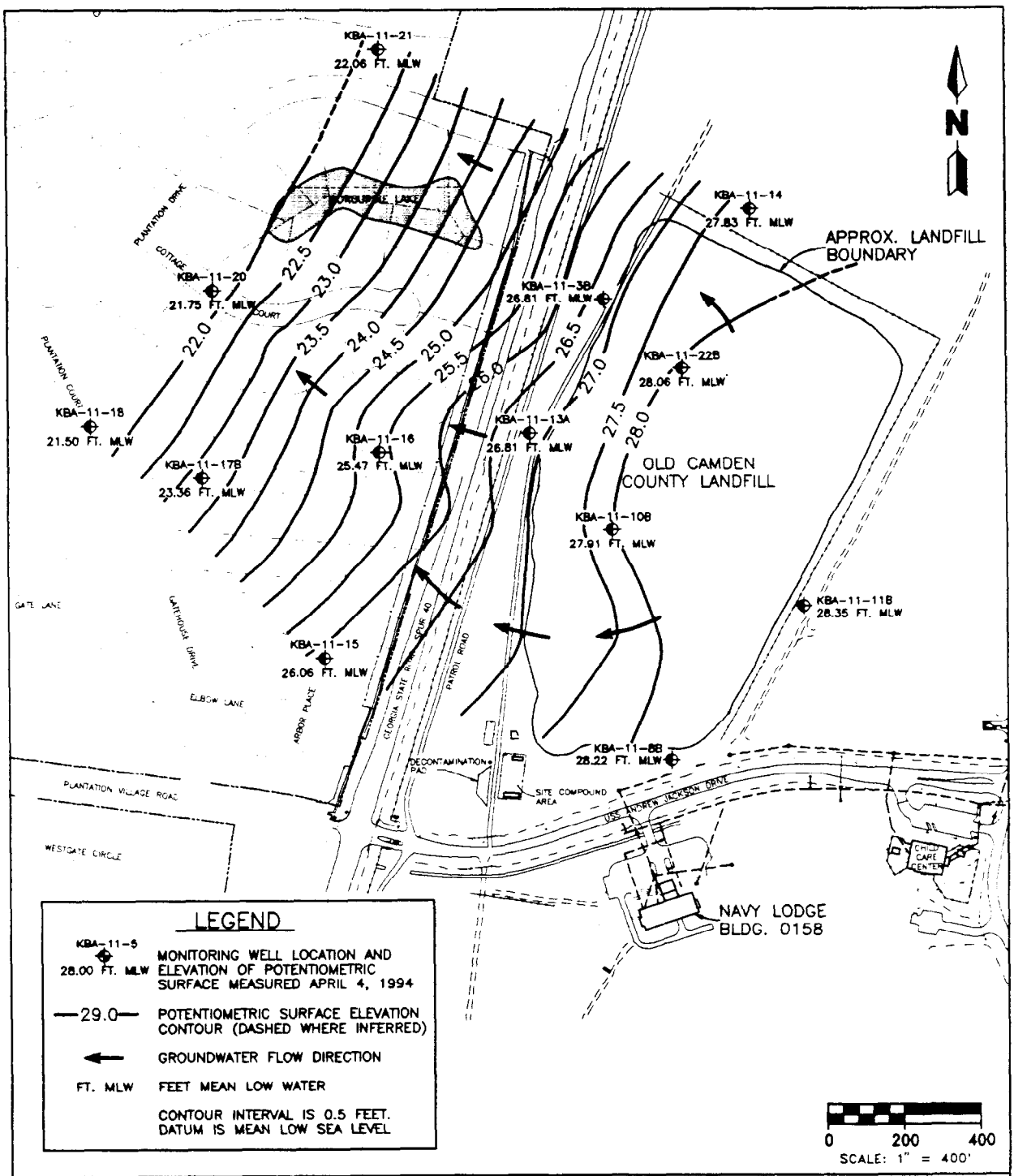

FIGURE 2-2

POTENTIOMETRIC SURFACE MAP

TECHNICAL MEMORANDUM FOR APRIL 1994 GROUNDWATER SAMPLING EVENT

NAVAL SUBMARINE BASE KINGS BAY, GEORGIA

D:\DWG\ABB\08503-48\4-94_GWS\FIG_2-2\DMF\940818

Table 2-1
Water-Level Elevation Data, April 4, 1994

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

Monitoring Well No.	Elevation TOC (feet mlw)	Water Level (feet BTOC)	Water Level (feet mlw)	Screened Interval (feet mlw)	Time
KBA-11-1	36.66	7.08	29.58	31.66 to 21.66	1137
KBA-11-2	36.02	7.32	28.70	30.32 to 20.32	1140
KBA-11-3A	34.63	7.15	27.48	29.43 to 19.43	1200
KBA-11-3B	33.49	6.68	26.81	(4.61) to (14.61)	1203
KBA-11-3C	33.88	12.53	21.35	(53.32) to (63.32)	1201
KBA-11-4	35.15	7.18	27.97	29.35 to 19.35	1206
KBA-11-5	36.03	7.20	28.83	30.03 to 20.03	1225
KBA-11-6	37.43	8.16	29.27	31.63 to 21.63	1228
KBA-11-7	37.38	7.79	29.59	31.28 to 21.28	1236
KBA-11-8A	37.48	8.34	29.14	31.76 to 21.76	1249
KBA-11-8B	38.20	9.98	28.22	4.60 to (5.40)	1247
KBA-11-8C	37.91	9.72	28.19	(14.83) to (24.83)	1245
KBA-11-9	34.66	5.60	29.06	29.06 to 19.06	1252
KBA-11-10A	35.42	6.13	29.29	25.82 to 15.82	1219
KBA-11-10B	38.03	10.12	27.91	(3.67) to (13.67)	1216
KBA-11-10C	38.28	13.49	24.79	(41.72) to (51.72)	1220
KBA-11-11A	35.85	7.36	28.49	8.95 to (1.05)	1241
KBA-11-11B	35.94	7.59	28.35	(10.66) to (20.66)	1239
KBA-11-11C	36.00	9.74	26.26	(34.70) to (44.70)	1238
KBA-11-12	35.72	8.62	27.10	5.22 to (4.78)	1256
KBA-11-13A	34.20	7.39	26.81	1.70 to (8.30)	1148
KBA-11-13B	34.86	11.64	23.22	(45.84) to (55.84)	1157
KBA-11-14	34.54	6.71	27.83	7.84 to (2.16)	1230
KBA-11-15	28.49	2.43	26.06	(0.51) to (10.51)	1210
KBA-11-16	28.66	3.19	25.47	(6.24) to (16.24)	1316
KBA-11-17A	25.71	2.08	23.63	5.71 to (4.29)	1320
KBA-11-17B	25.41	2.05	23.36	(9.39) to (19.39)	[1]1102
KBA-11-17C	24.86	3.83	21.03	(49.94) to (59.94)	1325
KBA-11-18	22.81	1.31	21.50	(12.99) to (22.99)	1318
KBA-11-19A	25.95	1.35	24.60	16.05 to 6.05	1311

See notes at end of table.

Table 2-1 (continued)
Water-Level Elevation Data, April 4, 1994

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

Monitoring Well No.	Elevation TOC (feet mlw)	Water Level (feet BTOC)	Water Level (feet mlw)	Screened Interval (feet mlw)	Time
KBA-11-19B	26.15	4.28	21.87	(34.05) to (44.05)	1315
KBA-11-20	23.07	1.32	21.75	(6.93) to (16.93)	1304
KBA-11-21	23.56	1.50	22.06	(6.84) to (16.84)	1256
KBA-11-22A	36.18	7.36	28.82	23.38 to 13.38	1212
KBA-11-22B	36.13	8.07	28.06	(6.47) to (16.47)	1209

[1] The water level listed for monitoring well KBA-11-17B was measured on April 5, 1994, at the time listed. The measurement collected on April 4, 1994, was incorrectly recorded as being 9.10 feet below the top of the well casing.

Notes: TOC = top of casing.
mlw = mean low water.
BTOC = below top of casing.
( ) = denotes negative number.

3.0 GROUNDWATER SAMPLING RESULTS

This section provides a brief discussion of the analytical data associated with the April 1994 groundwater sampling event, and a comparison of these data with the analytical data from the January 1994 sampling event. The comparison was done to assess whether the April 1994 data confirmed the absence of certain compounds, or groups of compounds, not detected in groundwater samples collected during January 1994. Also, this comparison is an initial evaluation of possible trends in characteristics of the groundwater contaminant plume and the effects of the Interim Measure groundwater extraction and treatment system on this plume. A more extensive evaluation of trends will be done after additional information is obtained from future sampling events.

Analytical data are included in Appendix A for analytes detected in one or more of the 39 groundwater samples collected during the April 1994 sampling event. Appendix B contains two rounds of analytical data, January and April 1994, for individual monitoring wells and for all analytes that were detected. For purposes of evaluation and presentation, the data have been grouped according to monitoring well location. The groups include background, landfill (Site 11), and subdivision (Crooked River Plantation) locations.

Background wells are those wells expected to provide analytical data representative of groundwater quality unaffected by the Site 11 disposal area and include KBA-11-7, KBA-11-9, KBA-11-11A, KBA-11-11B, and KBA-11-11C. Analytical data associated with samples from these wells supports the expectation that groundwater quality is not effected by releases from the landfill. This observation is based on the absence of VOCs and semivolatile organic compounds (SVOCs) that have been detected in groundwater samples from within and downgradient of the landfill and that are interpreted as being released from waste disposed in the landfill. Plume-related VOCs and SVOCs include fuel-related compounds, solvents, and phenol compounds.

The other 19 monitoring wells at the landfill and the 10 monitoring wells in the subdivision are release detection wells. The release detection monitoring wells are either in areas already effected by contaminants released from the Site 11 disposal area or are in areas that could potentially be effected as contaminants disperse and/or migrate with groundwater flow.

Nineteen release detection wells in the landfill area (see Figure 1-1) include eight wells located within the VOC plume (KBA-11-2, KBA-11-3A, KBA-11-3B, KBA-11-10A, KBA-11-10B, KBA-11-13A, KBA-11-22A, and KBA-11-22B). Four release detection wells (KBA-11-5, KBA-11-6, KBA-11-8A, and KBA-11-8B) are on the edge of the VOC plume based on the detection of low concentrations of plume-related VOCs. The VOC 1,4-dichlorobenzene was detected in groundwater samples collected from KBA-11-5 and KBA-11-6 during the 1992-1993 RFI bimonthly sampling program (ABB-ES 1993). This VOC was also detected in a groundwater sample from KBA-11-6 that was collected during the April 1994 sampling event. Solvents and fuel-related VOCs were detected in groundwater samples collected during 1992 and 1993 from monitoring well KBA-11-8A and in samples collected during January and April 1994 from monitoring well KBA-11-8B. The remaining seven wells in the landfill area are in areas unaffected by the VOC plume and are KBA-11-1, KBA-11-3C, KBA-11-4, KBA-11-8C, KBA-11-12, KBA-11-13B, and KBA-11-14.

Ten release detection wells are located in Crooked River Plantation Subdivision (see Figure 1-1). Five of the wells are located within the VOC plume (KBA-11-16, KBA-11-17A, KBA-11-17B, KBA-11-19A, and KBA-11-19B). Three detection wells (KBA-11-15 , KBA-11-17C, and KBA-11-20) are located in areas unaffected by the VOC plume and two other detection wells (KBA-11-18 and KBA-11-21) are interpreted as being on the edge of the plume based on concentrations of phenol, 1,1,-dichloroethane, and 4-methyl-2-pentanone, that are constituents of the plume.

Background. The background data set and means of evaluating data from detection wells relative to the background data have not been approved by EPD. A statistical approach will be applied to determine whether there is evidence that inorganic contaminants are present in groundwater. Four groundwater sampling events will provide data for statistical analyses. Two additional sampling events are planned, one in September 1994 and another tentatively planned for April 1995. The results of the statistical comparisons will be reported in the Supplemental RFI report that will be prepared in 1995.

Analytical data for analyses performed on samples collected during January and April 1994 from the five monitoring wells expected to provide background information are summarized in Table 3-1. In addition to inorganic constituents, six organic compounds have been detected in groundwater samples from three of the expected background wells. Four of the organic compounds are phthalates that could be artifacts of sampling and/or laboratory procedures. The other two organic compounds are pesticides.

In April 1994, two chlorinated pesticide compounds, aldrin and gamma-BHC (lindane), were detected in samples from two expected background locations, KBA-11-11C and KBA-11-9, at estimated concentrations of 0.006 NJ and 0.008 NJ micrograms per liter ($\mu g/\ell$), respectively. The NJ qualifier indicates that there is presumptive evidence for the presence of the compounds at an estimated concentration because the first and second gas chromatography columns had differences greater than 100 percent. Differences of this magnitude from replicate measurements cause the reported detection of the compounds to be suspect and they are consequently qualified with an "NJ". The concentrations reported are generally biased high because the higher of the two values is reported as the sample concentration.

Landfill. Table 3-2 summarizes analytical data for samples collected during January and April 1994 from 19 release detection wells in the area of the landfill. VOCs, SVOCs, chlorinated pesticides, and inorganic analytes were detected in the groundwater samples. No organophosphorus pesticide, herbicide, dioxin, or furan analytes were detected in samples collected during either sampling event.

The VOC data for the two sampling events are similar. The concentrations of trichloroethene and tetrachloroethene increased in a groundwater sample collected during April 1994 from monitoring well KBA-11-13A. The increase in concentrations of these compounds may be caused by the Interim Measure groundwater extraction system that was in operation during March. Previous investigations indicated that areas characterized by relatively high concentrations of trichloroethene, tetrachloroethene, and cis-1,2-dichloroethene were present to the west of the NSB property line. As a result, the Interim Measure activities were designed to capture and control migration of these "hot spots." Monitoring well

Table 3-1
Ranges of Concentrations and Frequencies of Detections in Groundwater Samples from Potential Background Locations January and April 1994

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

Analyte	MCL (µg/ℓ)	January 1994			April 1994			January and April 1994 Combined		
		Background Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL	Background Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL	Background Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL
Semivolatile Analytes										
Dimethylphthalate	---	2 J	1/5	---	ND	0/5	---	2 J	1/10	---
Butylbenzylphthalate	100	2 J	1/5	0/1	ND	0/5	0/0	2 J	1/10	0/1
Bis(2-ethylhexyl)phthalate	6	0.50 J and 5 J	2/5	0/2	12	1/5	1/1	0.50 J to 12	3/10	1/3
Diethylphthalate	---	ND	0/5	---	0.5 J and 0.8 J	2/5	---	0.5 J and 0.8 J	2/10	---
Pesticide Analytes										
gamma-BHC	0.2	ND	0/5	0/0	0.008 NJ	1/5	0/1	0.008 NJ	1/10	0/1
Aldrin	---	ND	0/5	---	0.006 NJ	1/5	---	0.006 NJ	1/10	---
Inorganic Analytes										
Aluminum	---	569 J to 28,900 J	4/4	---	269 J to 48,500	4/4	---	269 J to 48,500	8/8	---
Antimony	6	10.5 and 23.0 J	2/5	2/2	ND	0/5	0/0	10.5 and 23.0 J	2/10	2/2
Arsenic	50	1.8 J[3]	1/5	0/1	1.3 J to 8.0	3/5	0/3	1.3 J to 8.0	4/10	0/4
Barium	2,000	10.8 J to 45.0 J	5/5	0/5	21.0 J to 81 J	5/5	0/5	10.8 J to 81 J	10/10	0/10
Beryllium	4	0.12 J to 0.94 J	4/5	0/4	ND	0/5	0/0	0.12 J to 0.94 J	4/10	0/4
Cadmium	5	ND	0/5	0/0	ND	0/5	0/0	ND	0/10	0/0
Calcium	---	1,620 J to 64,800	4/4	---	2,540 J to 30,600	4/4	---	1,620 J to 64,800	8/8	---
Chromium	100	5.2 J to 17.2	5/5	0/5	10.4 to 53.9	5/5	0/5	5.2 J to 53.9	10/10	0/10
Cobalt	---	2.2 J	1/5	---	ND	0/5	---	2.2 J	1/10	---
Copper	1,300	2.3 J to 24.6 J	5/5	0/5	10.7 J to 27.2	5/5	0/5	2.3 J to 27.2	10/10	0/10
Iron	---	331 to 5,540	4/4	---	542 to 2,470	4/4	---	331 to 5,540	8/8	---
Lead	15	3.3 J to 8.1 J	3/5	0/3	4.7 J to 13.7	4/5	0/4	3.3 J to 13.7	7/10	0/7

See notes at end of table.

Table 3-1 (continued)
Ranges of Concentrations and Frequencies of
Detections in Groundwater Samples from Potential Background Locations January and April 1994

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

Analyte	MCL ($\mu g/\ell$)	January 1994			April 1994			January and April 1994 Combined		
		Background Range ($\mu g/\ell$)	Frequency[1]	Frequency[2] Above MCL	Background Range ($\mu g/\ell$)	Frequency[1]	Frequency[2] Above MCL	Background Range ($\mu g/\ell$)	Frequency[1]	Frequency[2] Above MCL
Inorganic Analytes (continued)										
Magnesium	---	345 J to 5,750	4/4	---	444 J to 2,590 J	4/4	---	345 J to 5,750	8/8	---
Manganese	---	1.5 J to 108	4/4	---	8.9 J to 49.0	4/4	---	1.5 J to 108	8/8	---
Mercury	2	ND	0/5	0/0	0.28	1/5	0/1	0.28	1/10	0/1
Nickel	100	8.4 J to 16.8 J	4/5	0/4	ND	0/5	0/0	8.4 J to 16.8 J	4/10	0/4
Potassium	---	3,600 J and 5,310	2/4	---	1,410 J to 4,700 J	4/4	---	1,410 J to 5,310	6/8	---
Selenium	50	ND	0/5	0/0	2.1 J and 2.5 J	2/5	0/2	2.1 J and 2.5 J	2/10	0/2
Silver	---	2.6 J	1/5	---	6.4 J	1/5	---	2.6 J and 6.4 J	2/10	---
Sodium	---	3,100 J to 28,200 J	4/4	---	4,410 J to 40,600	4/4	---	3,100 J to 40,600	8/8	---
Thallium	2	ND	0/5	0/0	ND	0/5	0/0	ND	0/10	0/0
Vanadium	---	1.6 J to 17.4 J	4/5	---	25.3 J	1/5	---	1.6 J to 25.3 J	5/10	---
Zinc	---	16.0 J to 62.4 J	3/5	---	59 J	1/5	---	16.0 J to 62.4 J	4/10	---
Sulfide	---	200 J to 1,600 J	4/5	---	ND	0/5	---	200 J to 1,600 J	4/10	---
Tin	---	ND	0/1	---	ND	0/1	---	ND	0/2	---

[1] Frequency is the number of sample locations with a detectable concentration of an analyte per total number of sample locations.
[2] Frequency above maximum contaminant level (MCL) is number of samples with concentration of analyte that exceeds the analyte's MCL per number of samples with detectable concentration of analyte.
[3] For replicate samples from the same location, one sample contained a detectable concentration of the analyte but the replicate sample did not.

Notes: MCL = maximum contaminant level.
$\mu g/\ell$ = micrograms per liter.
--- = not applicable.
J = estimated value.
ND = not detected.
BHC = benzene hexachloride.
NJ = presumptive evidence for the presence of a compound at an estimated concentration.

Table 3-2
Data Summary for Analytes Detected in Groundwater Samples from Monitoring Wells at Site 11, January and April 1994

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

Analyte	MCL (µg/ℓ)	January 1994			April 1994		
		Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL	Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL
Volatile Organic Compound							
Vinyl chloride	2	1 to 170 J	3/20	2/3	33 and 110 J	2/20	2/2
Chloroethane	—	3	1/20	—	ND	0/20	—
Carbon disulfide	—	0.5 J to 10	6/20	—	ND	0/20	—
1,1-Dichloroethane	—	0.60 J to 3	3/20	—	0.6 J and 3	2/20	—
cis-1,2-Dichloroethene	70	2 to 20	5/19	0/5	2 to 18	5/19	0/5
2-Butanone	—	38 J and 57 J	2/20	—	ND	0/20	—
Tetrachloroethene	5	ND	0/20	0/0	580	1/20	1/1
Trichloroethene	5	0.5 J to 300	3/20	1/3	0.6 J to 2,400	3/20	1/3
Benzene	5	0.4 J to 6	6/20	1/6	0.4 J to 6	6/20	1/6
4-Methyl-2-pentanone	—	3 J	1/20	—	0.9 J to 1 J	2/20	—
Toluene	1,000	0.4 J to 170	5/20	0/4	0.7 J to 89	5/20	0/5
1,2-Dichloroethene (total)	70[3]	2,900	1/1	1/1	1,800	1/1	1/1
Chlorobenzene	—	0.8 J to 2	3/20	—	1 to 4	4/20	0/4
Ethylbenzene	700	0.9 J to 130	5/20	0/5	2 to 120	5/20	0/5
Xylenes (total)	10,000	0.4 J to 240	4/20	0/4	2 to 200	4/20	0/4
1,4-Dichlorobenzene	75	2 and 6	2/20	—	0.5 J to 7	6/20	0/6
Semivolatile Organic Analytes							
Phenol	—	ND	0/20	—	0.8 J and 0.9 J	2/20	—
1,4-Dichlorobenzene	75	2 J to 8 J	4/20	0/4	2 J to 8 J	4/20	0/4
2-Methylphenol	—	5 J	1/20	—	1.5 J	1/20	—
4-Methylphenol	—	1 J to 54	3/20	—	5 J and 12	2/20	—
Naphthalene	—	0.6 J to 34	4/20	—	0.8 J to 47	4/20	—
2-Methylnaphthalene	—	0.60 J	1/20	—	0.5 J	1/20	—
Dimethylphthalate	—	3 J and 4 J[4]	1/20	—	ND	0/20	—
Diethylphthalate	—	0.5 J to 13	6/20	—	0.5 J to 8 J	9/20	—
Di-n-butylphthalate	—	4 J	1/20	—	1.1 J	1/20	—
bis(2-Ethylhexyl)phthalate	—	0.5 J to 6 J	10/20	—	8 J to 80	4/20	—
2,4-Dimethylphenol	—	54	1/20	—	19	1/20	—

See notes at end of table.

Table 3-2 (continued)
Data Summary for Analytes Detected in Groundwater Samples from Monitoring Wells at Site 11, January and April 1994

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

Analyte	MCL (µg/ℓ)	January 1994			April 1994		
		Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL	Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL
Pesticide Analytes							
beta-BHC	---	ND	0/20	---	0.084 J	1/20	0/1
gamma-BHC	0.2	ND	0/20	0/0	0.056 J and 0.072 J[4]	1/20	0/1
Heptachlor	0.4	ND	0/20	0/0	0.016 J[5]	1/20	0/1
alpha-Chlordane	2	ND	0/20	0/0	0.01 J and 0.027 J	2/20	0/2
gamma-Chlordane	2	ND	0/20	0/0	0.049 J and 0.056 J[4]	1/20	0/1
Inorganic Analytes							
Aluminum	---	130 J to 12,300 J	19/19	---	162 J to 64,100	19/19	---
Antimony	6	2.1 J to 3.4 J	6/20	0/6	ND	0/20	0/0
Arsenic	50	1.2 J to 5.8 J	13/20	0/13	1.0 J to 15.7	14/20	0/14
Barium	2,000	4.6 J to 61.1 J	20/20	0/20	6.7 J to 99.1 J	20/20	0/20
Beryllium	4	0.18 J to 0.45 J	5/20	0/5	2.1 J	1/20	0/1
Cadmium	5	3.5 J	1/20	0/1	3.7 J and 4.8 J	2/20	0/2
Calcium	---	1,500 J to 241,000 J	19/19	---	1,620 J to 230,000	19/19	---
Chromium	100	3.6 J to 25.2	12/20	0/12	5.6 J to 147	19/20	1/19
Cobalt	---	2.2 J to 7.0 J	3/20	---	9.6 J to 18.2 J	3/20	---
Copper	1,300	1.9 J to 45.4	10/20	0/10	3.2 J to 50.2	15/20	0/15
Iron	---	81.4 J to 41,800 J	19/19	---	388 to 45,300	18/19	---
Lead	15	2.1 J to 6.8	7/20	0/7	1.0 J to 27.3 J	17/20	3/17
Magnesium	---	457 J to 16,600	19/19	---	793 J to 17,700	19/19	---
Manganese	---	5.8 J to 415	19/19	---	7.2 J to 401	19/19	---
Mercury	2	0.35	1/20	0/1	0.24 to 0.44	3/20	0/3
Nickel	100	5.3 J to 48.4	8/20	0/7	25.0 J to 135	3/20	1/3
Potassium	---	964 J to 19,200	15/19	---	685 J to 18,300	19/19	---
Selenium	50	ND	0/20	0/0	2.0 J and 2.7 J	2/20	0/2

See notes at end of table.

Table 3-2 (continued)
Data Summary for Analytes Detected in Groundwater Samples from Monitoring Wells at Site 11, January and April 1994

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

Analyte	MCL ($\mu g/\ell$)	January 1994			April 1994		
		Range ($\mu g/\ell$)	Frequency[1]	Frequency[2] Above MCL	Range ($\mu g/\ell$)	Frequency[1]	Frequency[2] Above MCL
Inorganic Analytes (continued)							
Sodium	—	1,390 J to 50,400 J	19/19	—	2,780 J to 43,700	19/19	—
Thallium	2	ND	0/20	0/0	1.0 J[5]	1/20	0/1
Vanadium	—	2.1 J to 14.4 J	15/20	—	5.5 J to 46.8 J	10/20	—
Zinc	—	3.8 J to 75.0	14/20	—	38.4 to 164	10/20	—
Sulfide	—	200 J to 2,200 J	14/20	—	2,000	1/20	—

[1] Frequency is the number of sample locations with a detectable concentration of an analyte per total number of sample locations.
[2] Frequency above maximum contaminant limit (MCL) is number of samples with concentration of analyte that exceeds the analyte's MCL per number of samples with detectable concentration of analyte.
[3] MCL for cis-1,2-dichloroethene.
[4] Concentrations are for replicate samples from the same location.
[5] For replicate samples from the same location, one sample contained a detectable concentration of the analyte but the replicate sample did not.

Notes: MCL = maximum contaminant level.
$\mu g/\ell$ = micrograms per liter.
J = estimated value.
— = not applicable.
ND = not detected.

KBA-11-13A is located in an area that would reflect changes in groundwater quality if the "hot spots" move to the east towards the landfill.

The SVOC analytical data for the samples collected from the release detection wells in the area of the landfill during January and April are similar. However, pesticides were detected for the first time in samples collected during April 1994 following a change in the contract laboratory. Table 3-2 presents the concentrations and types of compounds that were detected. These compounds were detected in groundwater samples from three monitoring wells, KBA-11-10B, KBA-11-14, and KBA-11-22B. Confirmation sampling and analyses are needed to establish the site as the source of the pesticides reported.

The inorganic data for the two sampling events are summarized in Table 3-2. The two data sets are generally similar. Variations from January to April include relative increases in concentrations of aluminum, chromium, and nickel. Also, the frequency of detection increased for lead.

Crooked River Plantation Subdivision. Table 3-3 summarizes analytical data for groundwater samples collected from detection wells in Crooked River Plantation Subdivision during January and April 1994. VOC, SVOC, and inorganic analytes were detected in the groundwater samples. No chlorinated pesticide, organophosphorus pesticide, herbicide, dioxin, or furan analytes were detected in the groundwater samples collected during either sampling event.

The analytical data for the samples collected in January 1994 contained seven VOCs that were not detected in groundwater samples collected during the April sampling event. Fifteen VOC compounds were detected in samples from the January sampling event but only eight VOC compounds were detected in samples from the April event. Except for VOCs that belong to the chemical class of compounds known as ketones, including acetone, 2-butanone, and 4-methyl-2-pentanone, concentrations of individual VOCs were less than 24 $\mu g/\ell$.

SVOCs detected in groundwater samples from the subdivision include phthalate and phenol compounds. These SVOCs were detected in samples from both sampling events. The concentrations of phenol compounds in samples from the April 1994 sampling event were lower compared to corresponding data for the samples collected in January. Three phenol compounds were detected in samples from the January sampling event at concentrations ranging from 3 J to 670 $\mu g/\ell$. In April, samples from the release detection wells in the subdivision contained two phenol compounds at concentrations ranging from 0.8 J to 270 $\mu g/\ell$.

The inorganic data for the two sampling events are generally consistent. Variations from January to April include a decrease in the frequency of detection for antimony and beryllium and an increase in the frequency for lead.

Table 3-3
Data Summary for Analytes Detected in Groundwater Samples from Monitoring Wells in Crooked River Plantation Subdivision, January and April, 1994

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

Analyte	MCL (µg/ℓ)	January 1994			April 1994		
		Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL	Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL
Volatile Organic Analytes							
Chloromethane	—	0.60 J[3]	1/10	—	ND	0/10	—
Methylene chloride	5	7	1/10	1/1	0.5 J and 11	2/10	1/2
Acetone	—	100 J and 320 J	2/10	—	84 and 120 J	2/10	—
Carbon disulfide	—	0.40 J to 2	3/10	—	ND	0/10	—
1,1-Dichloroethene	7	0.70 J	1/10	0/1	ND	0/10	0/0
1,1-Dichloroethane	—	0.60 J to 13	3/10	—	11	1/10	—
cis-1,2-Dichloroethene	70	0.70 J to 7	2/10	0/2	0.8 J	1/10	0/1
2-Butanone	—	61 J and 380 J	2/10	—	200	1/10	—
1,2-Dichloropropane	5	0.80 J	1/10	0/1	ND	0/10	0/0
Trichloroethene	5	0.60 J	1/10	0/1	ND	0/10	0/0
Benzene	5	0.50 J and 2	2/10	0/2	ND	0/10	0/0
4-Methyl-2-pentanone	—	10 to 270	3/10	—	6 to 290	3/10	—
Toluene	1,000	23	1/10	0/1	24	1/10	0/1
1,2-Dichloroethene (total)	70[4]	ND	0/1	0/0	4 J	1/1	0/1
Ethylbenzene	700	5	1/10	0/1	ND	0/10	0/0
Xylenes (total)	10,000	12	1/10	0/1	5.4 J	1/10	0/1
Semivolatile Organic Analytes							
Phenol	—	100	1/10	—	0.8 J to 40	3/10	—
2-Methylphenol	—	8 J	1/10	—	ND	0/10	—
4-Methylphenol	—	3 J and 670	2/10	—	4 J and 270	2/10	—
Diethylphthalate	—	8 J	1/10	—	0.5 J	1/10	—
Di-n-butylphthalate	—	3 J and 4 J	2/10	—	ND	0/10	—
Butylbenzylphthalate	100	ND	0/10	0/0	0.6 J	1/10	0/1
bis(2-Ethylhexyl)phthalate	—	1 J to 29	6/10	—	8 J to 15	3/10	—
Inorganic Analytes							
Aluminum	—	94.8 J to 57,800 J	9/9	—	195 J to 68,100	9/9	—
Antimony	6	1.9 J to 6.1	4/10	1/4	ND	0/10	0/0
Arsenic	50	1.3 J to 6.4 J	8/10	0/8	2.8 J to 19.5	8/10	0/8
Barium	2,000	10.0 J to 432 J	10/10	0/10	14.4 J to 524	10/10	0/10
Beryllium	4	0.19 J to 2.0 J	6/10	0/5	ND	0/10	0/0
Calcium	—	3,220 J to 52,900	9/9	—	2,850 J to 39,400	9/9	—
Chromium	100	7.8 J to 69.0	7/10	0/7	8.5 J to 76.7	8/10	0/8

See notes at end of table.

Table 3-3 (continued)
Data Summary for Analytes Detected in Groundwater Samples from Monitoring Wells in Crooked River Plantation Subdivision, January and April, 1994

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

Analyte	MCL (µg/ℓ)	January 1994			April 1994		
		Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL	Range (µg/ℓ)	Frequency[1]	Frequency[2] Above MCL
Cobalt	—	1.7 J to 11.5 J	4/10	—	9.0 J and 13.9 J[5]	1/10	—
Copper	1,300	3.1 J to 115	8/10	0/8	13.6 J to 39.1	8/10	0/8
Iron	—	1,060 to 9,250	9/9	—	970 to 17,300	9/9	—
Lead	15	2.0 J to 12.1	3/10	0/3	1.3 J to 15.2 J	8/10	1/8
Magnesium	—	811 J to 26,700	9/9	—	738 J to 21,300	9/9	—
Manganese	—	8.6 J to 45.9	9/9	—	13.8 J to 69.3	9/9	—
Nickel	100	6.3 J to 55.6	6/10	0/6	12.9 J to 29.0 J	4/10	0/4
Potassium	—	804 J to 3,980 J	5/9	—	642 J to 5,310	9/9	—
Selenium	50	1.8 J	1/10	0/1	4.5 J to 13.0 J	3/10	0/3
Sodium	—	8,150 J to 218,000 J	9/9	—	5,540 to 198,000	9/9	—
Thallium	2	ND	0/10	0/0	1.1 J and 1.8 J	2/10	0/2
Vanadium	—	2.2 J to 30.2 J	5/10	—	12.5 J to 63.6 J	3/10	—
Zinc	—	7.0 J to 84.3	8/10	—	ND	0/10	—
Sulfide	—	200 J to 5,300 J	8/10	—	2,000 to 4,000	3/10	—
Tin	—	9.0 J	1/1	—	ND	0/1	—

[1] Frequency is the number of sample locations with a detectable concentration of an analyte per total number of sample locations.
[2] Frequency above maximum contaminant limit (MCL) is number of samples with concentration of analyte that exceeds the analyte's MCL per number of samples with detectable concentration of analyte.
[3] For replicate samples from the same location, one sample contained a detectable concentration of the analyte but the replicate sample did not.
[4] MCL for cis-1,2-dichloroethene.
[5] Concentrations are for replicate samples from the same location.

Notes: µg/ℓ = micrograms per liter.
MCL = maximum contaminant limit.
— = not applicable.
J = estimated value.
ND = not detected.

4.0 RECOMMENDATIONS

During April 1994, groundwater samples were collected from 35 monitoring wells located in and around Site 11, Old Camden County Landfill, and in Crooked River Plantation Subdivision. This was the second sampling event that included 25 new monitoring wells installed during October and November 1993. The first sampling event was conducted in January 1994. The 25 new monitoring wells were installed in and around a plume of VOC contamination that has been attributed to a release from the Site 11 disposal area. This chapter makes recommendations regarding the analytical program appropriate for future groundwater sampling events.

The analytical program for future sampling events will be revised to include VOC, SVOC, and inorganic analyses using CLP protocol. Additionally, chlorinated pesticides that were detected in groundwater samples collected during April 1994 from five monitoring wells will be analyzed in samples from the same five monitoring wells during the next sampling event. Pesticides have not been detected in shallow monitoring wells, installed in early 1991, that have been sampled eight times to date. Pesticides were not detected in groundwater samples from the 35 monitoring wells during the January 1994 sampling event. Subsurface soil samples collected during the drilling program in October and November 1993 also did not indicate the presence of pesticides. If pesticide analytes are not confirmed in future groundwater samples, further pesticide analyses will not be recommended unless future investigation of the source area indicates that pesticides are potential contaminants at the site.

Previous groundwater sampling events included analyses for constituents listed in Appendix IX of 40 CFR 264. RCRA requires that Appendix IX constituents be characterized in contaminated groundwater. Except for sulfide, the analytes detected by these analyses can be monitored using CLP routine analytical services. Sulfide will continue to be monitored using SW-846 analytical procedures.

A background data set and statistical approach for identifying potential inorganic contaminants will be developed for review and approval by EPD. It is anticipated that future investigations of three other sites at the NSB would include collection of background groundwater quality data for a base-wide data set. This data set and the data from the five monitoring wells at Site 11, KBA-11-7, KBA-11-9, KBA-11-11A, KBA-11-11B, and KBA-11-11C, will be considered for use in evaluating concentrations of inorganic analytes in groundwater samples from release detection wells at Site 11 and in Crooked River Plantation Subdivision.

REFERENCES

ABB Environmental Services, Inc. (ABB-ES), 1993, RFI Interim Report for Site 11, Naval Submarine Base, Kings Bay, Georgia: prepared for SOUTHNAVFACENGCOM, Contract No. N62467-89-D-0317, December.

ABB-ES, 1994a, Technical Memorandum, 1993 Field Program and January 1994 Groundwater Sampling Event, Site 11, Naval Submarine Base, Kings Bay, Georgia: prepared for SOUTHNAVFACENGCOM, Contract No. N62467-89-D-0317, August.

ABB-ES, 1994b, Supplemental Resource Conservation and Recovery Act Facility Investigation for Site 11, Volume I, Workplan, Naval Submarine Base, Kings Bay, Georgia: prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), Contract No. N62467-89-D-0317, August.

ABB-ES, 1994c, Supplemental Resource and Recovery Act Facility Investigation for Site 11, Volume II, Sampling and Analysis Plan, Naval Submarine Base, Kings Bay, Georgia: prepared for SOUTHNAVFACENGCOM, Contract No. N62467-89-D-0317, August.

Bureau of National Affairs, 1993, Georgia Hazardous Waste Management Rules: Washington, D.C., August.

Code of Federal Regulations, 1992, Title 40, Part 264, Subpart F - Releases from Solid Waste Management Units: Office of Federal Register, National Archives and Records Administration, revised July 1992.

U.S. Environmental Protection Agency (USEPA), 1986, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846): 3rd Edition.

USEPA, 1988, Laboratory Data Validation: Functional Guidelines for Evaluating Inorganics Analyses, July.

USEPA, 1990, National Functional Guidelines for Organic Data Review: December 1990, revised June 1991.

USEPA, 1991a, Contract Laboratory Program, Statement of Work for Inorganics Analysis: USEPA Document No. ILM02.1, revised June 1991.

USEPA, 1991b, Draft Pesticide/Aroclor Data Review Guidelines: June 1991.

USEPA, 1992, Contract Laboratory Program, Statement of Work for Organics Analysis: USEPA Document No. OLC01.6, October.

APPENDIX A

ANALYTICAL DATA FOR ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED APRIL 1994

Table A-1
Validated Analytical Results of Organic Appendix IX List Analytes in Groundwater Samples

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

WELL LOCATION: / SAMPLE I.D.:		Background KBA-11-11B 11B GW 01	Site 11 KBA-11-13A 13A GW 01	Subdivision KBA-11-16 16 GW 02
Volatile Analysis - Appendix IX (µg/ℓ)	**PQL**			
Acetone	50	50 U	830 U[1]	84
Methylene chloride	5	5 U	83 U[1]	11
Methyl ethyl ketone	50	50 U	830 U[1]	200
4-Methyl-2-pentanone	50	50 U	830 U[1]	290
Tetrachloroethene	5	5 U	580	8.4 U[1]
1,1-Dichloroethane	5	5 U	83 U[1]	11
Vinyl chloride	10	10 U	110 J[2]	17 U[1]
1,2-Dichloroethene (total)	5	5 U	1,800	4 J[2]
Trichloroethene	5	5 U	2,400	8.4 U[1]
Toluene	5	5 U	89	24
Ethylbenzene	5	5 U	120	8.4 U[1]
Xylenes (total)	5	5 U	200	5.4 J[2]
Semivolatile Analysis - Appendix IX (µg/ℓ)	**PQL**			
Phenol	10	10 U	10 U	40
2- Methylphenol	10	10 U	1.5 J[2]	10 U
2,4-Dimethylphenol	10	10 U	19	10 U
Naphthalene	10	10 U	47	10 U
Diethylphthalate	10	10 U	7.1 J[2]	10 U
Di-n-butylphthalate	10	10 U	1.1 J[2]	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	24	10 U
3- & 4-Methylphenol	20	10 U	12	270
Organochlorine Pesticides and PCBs Appendix IX List				
No organochlorine pesticides and PCBs were detected in the groundwater samples.				
Organophosphorus Pesticides - Appendix IX List				
No organophosphorus pesticides were detected in the groundwater samples.				
Chlorinated Herbicides - Appendix IX List				
No chlorinated herbicides were detected in the groundwater samples.				
Polychlorinated Dioxins and Furans - Appendix IX List				
No polychlorinated dioxins/furans were detected in the groundwater samples.				

See notes at end of table.

Table A-1 (continued)
Validated Analytical Results of Organic Appendix IX List Analytes in Groundwater Samples

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	WELL LOCATION:	Background KBA-11-11B	Site 11 KBA-11-13A	Subdivision KBA-11-16
	SAMPLE I.D.:	11B GW 01	13A GW 01	16 GW 02
Inorganic Analytes - Appendix IX (µg/ℓ)	**CRDL[3]**			
Arsenic	10	8.0	8.6	6.1
Barium	200	81 J	70 J	61 J
Chromium	10	41	47	22
Copper	25	18	20	39
Lead	3	9.6 J[4]	4.4 J[4]	3.0 UJ[3]
Zinc	20	59 J[4]	73 J[4]	50 UJ[4]
Sulfide	500	1,000 U	1,000 U	4,000

[1] Elevated sample quantitation limits because analysis required dilution of sample
[2] Sample results flagged "J" as estimated because concentration is less than the sample quantitation limit.
[3] The practical quantitation limits listed for inorganic analytes are from the Contract Laboratory Program (CLP) because SW-846 analytical data are reported using CLP protocol when analyses are conducted at a CLP laboratory. This protocol results in qualification of values as estimated when the values are greater than the method detection limit but less than the CLP contract required quantitation limits. The SW-846 methods do not specify required quantitation limits for inorganic data.
[4] Sample values flagged "J" and sample quantitation limits flagged "UJ" as estimated because matrix spike recoveries were below the lower control limit.

Notes: I.D. = identification.
µg/ℓ = micrograms per liter.
PQL = practical quantitation limit.
U = not detected at the quantitation limit indicated.
J = estimated value.
PCB = polychlorinated biphenyls.
CRDL = contract required detection limit.

Table A-2
Validated Analytical Results of Organic Target Compound List Analytes Detected in Groundwater Samples

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	WELL LOCATION:	KBA-11-1	KBA-11-2	KBA-11-3A	KBA-11-3B	KBA-11-3C	KBA-11-4	KBA-11-5	KBA-11-6	KBA-11-7
	SAMPLE I.D.:	01 GW 02	02 GW 02	03A GW 02	03B GW 02	03C GW 02	04 GW 02	05 GW 02	06 GW 02	07 GW 02
	DATE SAMPLED:	04/05/94	04/09/94	04/09/94	04/05/94	04/05/94	04/07/94	04/07/94	04/07/94	04/06/94
VOLATILE ANALYSIS - TCL (µg/ℓ)	**CRQL**									
Vinyl Chloride	1	1 U	33	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene Chloride	2	2 U	3 U[1]	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Acetone	5	5 UR[2]	8 UR[1,3]	5 UR[3]	5 UR[3]	5 UR[2]	5 UR[3]	5 UR[3]	5 UR[3]	5 UR[3]
1,1-Dichloroethane	1	1 U	2 U[1]	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	1	1 U	10	1 U	18	1 U	1 U	1 U	1 U	1 U
Trichloroethene	1	1 U	2 U[1]	1 U	0.6 J[4]	1 U	1 U	1 U	1 U	1 U
Benzene	1	1 U	2 U[1]	1 U	6	1 U	1 U	1 U	1 U	1 U
4-Methyl-2-Pentanone	5	5 U	8 U[1]	5 U	0.9 J[4]	5 U	5 U	5 U	5 U	5 U
Toluene	1	1 U	0.7 J[4]	1 U	0.8 J[4]	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	1	1 U	2 U[1]	3	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	1	1 U	2 U[1]	1 U	9	1 U	1 U	1 U	1 U	1 U
Xylene (total)	1	1 U	2 U[1]	1 U	2	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	1	1 U	0.8 J[4]	7	1 U	1 U	1 U	1 U	0.5 J[4]	1 U
SEMIVOLATILE ANALYSIS-TCL (µg/ℓ)	**CRQL**									
Phenol	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	8 J[4]	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	0.6 J[4]	8 J[4]	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
PESTICIDES AND PCBS - TCL (µg/ℓ)	**CRQL**									
beta-BHC	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
gamma-BHC	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
Heptachlor	0.05	0.05 UJ[5,6]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
Aldrin	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
alpha-Chlordane	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
gamma-Chlordane	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]

See notes at end of table.

Table A-2 (Continued)
Validated Analytical Results of Organic Target Compound List Analytes Detected in Groundwater Samples

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

WELL LOCATION:		KBA-11-8A	KBA-11-8B	KBA-11-8C	KBA-11-9	KBA-11-10A	KBA-11-10A	KBA-11-10B	KBA-11-10C	KBA-11-11A
SAMPLE I.D.:		08A GW 02	08B GW 02	08C GW 02	09 GW 02	10A GW 02	10A GW 02D	10B GW 02	10C GW 02	11A GW 01
DATE SAMPLED:		04/06/94	04/06/94	04/06/94	04/05/94	04/07/94	04/07/94	04/05/94	04/07/94	04/05/94
VOLATILE ANALYSIS - TCL (µg/ℓ)	**CRQL**									
Vinyl Chloride	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene Chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Acetone	5	5 UR[3]	11 UR[3,7]	5 UR[3]	5 UR[3]	5 UR[3]	5 UR[3]	10 UR[2,7]	5 UR[3]	26 UR[2,7]
1,1-Dichloroethane	1	1 U	3	1 U	1 U	1 U	1 U	0.6 J[4]	1 U	1 U
cis-1,2-Dichloroethene	1	1 U	2	1 U	1 U	1 U	1 U	2	1 U	1 U
Trichloroethene	1	1 U	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzene	1	1 U	0.5 J[4]	1 U	1 U	0.4 J[4]	0.5 J[4]	1	1 U	1 U
4-Methyl-2-pentanone	5	5 U	1 J[4]	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	1	1 U	1 U	1 U	1 U	1 U	1 U	0.7 J[4]	1 U	1 U
Chlorobenzene	1	1 U	1 U	1 U	1 U	1	2	1	1 U	1 U
Ethylbenzene	1	1 U	2	1 U	1 U	1 U	1 U	12	1 U	1 U
Xylenes (total)	1	1 U	1 U	1 U	1 U	1 U	1 U	3	1 U	1 U
1,4-Dichlorobenzene	1	1 U	1 U	1 U	1 U	4	4	2	1 U	1 U
SEMIVOLATILE ANALYSIS-TCL (µg/ℓ)	**CRQL**									
Phenol	10	10 U	10 U	10 U	10 U	10 U	10 U	0.8 J[4]	0.9 J[4]	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	3 J[4]	3 J[4]	2 J[4]	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U	10 U	3 J[4]	3 J[4]	3 J[4]	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	0.5 J[4]	0.5 J[4]	10 U	10 U	10 U
Diethylphthalate	10	10 U	1 J[4]	0.8 J[4]	0.5 J[4]	0.5 J[4]	0.5 J[4]	4 J[4]	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
PESTICIDES AND PCBS - TCL (µg/ℓ)	**CRQL**									
beta-BHC	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
gamma-BHC	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.008 NJ[4,5,8]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5,6]	0.05 UJ[5]
Heptachlor	0.05	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5,6]	0.05 UJ[5]	0.05 UJ[5,6]
Aldrin	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
alpha-Chlordane	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.01 J[4,5,9]	0.05 UJ[5]	0.05 UJ[5]
gamma-Chlordane	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]

See notes at end of table.

Table A-2 (Continued)
Validated Analytical Results of Organic Target Compound List Analytes Detected in Groundwater Samples

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

WELL LOCATION:		KBA-11-11C	KBA-11-12	KBA-11-12	KBA-11-13B	KBA-11-14	KBA-11-15	KBA-11-17A	KBA-11-17A	KBA-11-17B
SAMPLE I.D.:		11C GW 01	12 GW 02	12 GW 02D	13B GW 02	14 GW 02	15 GW 02	17A GW 02	17A GW 02D	17B GW 02
DATE SAMPLED:		04/05/94	04/06/94	04/06/94	04/09/94	04/06/94	04/06/94	04/06/94	04/06/94	04/07/94
VOLATILE ANALYSIS - TCL (µg/ℓ)	**CRQL**									
Vinyl chloride	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Methylene chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	0.5 J[4]
Acetone	5	15 UR[2,7]	5 UR[3]	5 UR[3]	5 UR[3]	5 UR[3]	8 UR[3,7]	5 UR[3]	8 UR[3,7]	7 UR[3,7]
1,1-Dichloroethane	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Trichloroethene	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Benzene	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Methyl-2-pentanone	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6
Toluene	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Ethylbenzene	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene (total)	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
SEMIVOLATILE ANALYSIS - TCL (µg/ℓ)	**CRQL**									
Phenol	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 J[4]
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	4 J[4]
Naphthalene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	0.8 J[4]	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	12	10 U	10 U	80	10 U	10 U	10 U	10 U	10 U
PESTICIDES AND PCBS - TCL (µg/ℓ)	**CRQL**									
beta-BHC	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.084 J[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
gamma-BHC	0.05	0.05 UJ[5]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5,6]
Heptachlor	0.05	0.05 UJ[5,6]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5,6]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
Aldrin	0.05	0.006 NJ[5,8]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
alpha-Chlordane	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
gamma-Chlordane	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]

See notes at end of table.

Table A-2 (Continued)
Validated Analytical Results of Organic TCL Analytes Detected in Groundwater Samples

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	WELL LOCATION:	KBA-11-17C	KBA-11-18	KBA-11-19A	KBA-11-19B	KBA-11-20	KBA-11-21	KBA-11-22A	KBA-11-22B	KBA-11-22B
	SAMPLE I.D.:	17C GW 02	18 GW 02	19A GW 02	19B GW 02	20 GW 02	21 GW 02	22A GW 02	22B GW 02	22B GW 02D
	DATE SAMPLED:	04/06/94	04/06/94	04/07/94	04/06/94	04/06/94	04/06/94	04/05/94	04/05/94	04/05/94
VOLATILE ANALYSIS - TCL (µg/ℓ)	**CRQL**									
Vinyl chloride	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U[1]	2 U
Methylene chloride	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	5 U[1]	5 U[1]
Acetone	5	11 UR[3,7]	9 UR[3,7]	5 UR[3]	120 J[3]	7 UR[3,7]	14 UR[3,7]	5 UR[3]	82 J[2]	70 J[2]
1,1-Dichloroethane	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	2 U[1]
cis-1,2-Dichloroethene	1	1 U	1 U	0.8 J[4]	1 U	1 U	1 U	1 U	18	17
Trichloroethene	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	2 U[1]
Benzene	1	1 U	1 U	1 U	1 U	1 U	1 U	0.6 J[4]	4	4
4-Methyl-2-pentanone	5	5 U	10	5 U	6 U[1]	5 U	5 U	5 U	12 U[1]	12 U[1]
Toluene	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	4	5
Chlorobenzene	1	1 U	1 U	1 U	1 U	1 U	1 U	4	2 U[1]	2 U[1]
Ethylbenzene	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	44	45
Xylene (total)	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	5	6
1,4-Dichlorobenzene	1	1 U	1 U	1 U	1 U	1 U	1 U	5	2 U[1]	2 U[1]
SEMIVOLATILE ANALYSIS - TCL (µg/ℓ)	**CRQL**									
Phenol	10	10 U	10 U	10 U	10 U	10 U	0.8 J[4]	10 U	10 U	10 U
1,2-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U	10 U	10 U	10 U	10 U	4 J[4]	10 U	10 U
4-Methylphenol	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	6 J[4]	5 J[4]
Naphthalene	10	10 U	10 U	10 U	10 U	10 U	10 U	0.8 J[4]	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U	10 U	10 U	0.5 J[4]	0.6 J[4]	8 J[4]	8 J[4]
Butylbenzylphthalate	10	10 U	10 U	10 U	10 U	10 U	0.6 J[4]	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10	8 J[4]	15	10 U	10 U	10 U	12	8 J[4]	18	10 U
PESTICIDES AND PCBS - TCL (µg/ℓ)	**CRQL**									
beta-BHC	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
gamma-BHC	0.05	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5,6]	0.05 UJ[5]	0.072 J[5]	0.056 J[5,10]
Heptachlor	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.016 J[4,5,6,10]
Aldrin	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]
alpha-Chlordane	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.023 J[4,5]	0.027 J[4,5,10]
gamma-Chlordane	0.05	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.05 UJ[5]	0.049 J[4,5]	0.056 J[5,10]

See notes at end of table.

Table A-2 (Continued)
Validated Analytical Results of Organic Target Compound List Analytes Detected in Groundwater Samples

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

[1] Elevated sample quantitation limit (SQL) because analysis required dilution of sample.
[2] Positive results flagged "J" as estimated and SQL flagged "R" as rejected because the initial calibration for the compound had percent relative standard deviation (RSD) greater than 30 percent and relative response factor (RRF) less than 0.05.
[3] Positive values flagged "J" as estimated and SQLs rejected because the continuing calibration for the compound had an RRF less than 0.05.
[4] Sample results flagged "J" as estimated because concentration is less than the contract required quantitation limit.
[5] Positive values flagged "J" and SQLs flagged "UJ" as estimated because surrogate recoveries were outside quality control (QC) limits.
[6] Positive values flagged "J" and SQLs flagged "UJ" as estimated because percent RSDs were above the QC limit.
[7] Elevated sample quantitation limits due to laboratory and/or field blank contamination.
[8] Positive value flagged "NJ" as tentatively identified at an estimated concentration because first and second column analyses had percent difference greater than 100 percent.
[9] Positive value flagged "J" as estimated because first and second column analyses had percent difference between 25 and 100 percent.
[10] Positive value flagged "J" as estimated because extraction was performed 2 days outside holding time.

Notes: CRQL = contract required quantitation limit.
J = estimated value.
I.D. = identification.
PCB = polychlorinated biphenyls.
RRF = relative response factor.
TCL = target compound list.
U = not detected at the quantitation limit indicated.
UR = not detected, quantitation limit rejected per validation (see footnote number 1).
UJ = not detected, estimated quantitation limit.

Table A-3
Validated Analytical Results of Inorganic Target Analyte List Analytes Detected in Groundwater Samples (µg/ℓ)

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

WELL LOCATION:		Site 11	Site 11	Site 11	Site 11	Site 11	Site 11
WELL I.D.:		KBA-11-1	KBA-11-2	KBA-11-3A	KBA-11-3B	KBA-11-3C	KBA-11-4
SAMPLE I.D.:		01 GW 02	02 GW 02	03A GW 02	03B GW 02	03C GW 02	04 GW 02
DATE SAMPLED:		04/05/94	04/05/94	04/05/94	04/05/94	04/05/94	04/07/94
INORGANIC TAL ANALYTE	**CRDL**						
Aluminum	200	16,700 J[1]	20,700 J[1]	12,200 J[1]	13,100 J[1]	162 J[1]	2,960
Antimony	5	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Arsenic	10	1.0 U	2.3 J[2]	1.0 U	10.9	1.0 U	1.2 J[2]
Barium	200	31.9 J[2]	28.5 J[2]	24.2 J[2]	99.1 J[2]	11.4 J[2]	6.7 J[2]
Beryllium	5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Cadmium	5	3.0 U	3.0 U	3.0 U	3.0 U	3.3 U[3]	3.0 UJ[4]
Calcium	5,000	2,790 J[2]	48,700	230,000	1,620 J[2]	50,100	125,000
Chromium	10	24.6	26.5	5.6 J[2]	73.1	8.7 J[2]	5.0 U
Cobalt	50	9.0 U	9.0 U	9.0 U	9.6 J[2]	10.3 J[2]	9.0 U
Copper	25	11.9 J[2]	4.1 J[2]	3.0 U	21.3 J[2]	3.2 J[2]	6.6 UJ[3,4]
Iron	100	968	3,550	5,870	9,200	194 U[3]	388
Lead	3	16.3	19.2	4.1	8.1	1.0 U	1.0 UJ[5]
Magnesium	5,000	1,220 J[2]	3,870 J[2]	7,710	793 J[2]	6,640	3,480 J[2]
Manganese	15	8.2 J[2]	24.6	371	59.9	7.2 J[2]	39.7
Mercury	0.2	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	40	12.6 U[3]	12.0 U	12.0 U	46.6	12.0 U	12.0 U
Potassium	5,000	685 J[2]	3,760 J[2]	3,710 J[2]	8,360	8,000	1,850 J[2]
Selenium	5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 UJ[6]	2.0 U
Silver	10	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 UJ[4]
Sodium	5,000	9,090	7,130	5,890	34,700	25,400	3,840 J[2]
Thallium	10	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ[5]
Vanadium	50	5.0 U	6.0 J[2]	5.0 U	18.4 J[2]	5.0 U	5.0 UJ[4]
Zinc	20	34.2 U[3]	14.5 U[3]	29.6 U[3]	57.8	11.4 U[3]	64.7 U[3]
Sulfide	1,000	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U

See notes at end of table.

Table A-3 (Continued)
Validated Analytical Results of Inorganic Target Analyte List Analytes Detected in Groundwater Samples (µg/ℓ)

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	WELL LOCATION:	Site 11	Site 11	Background	Site 11	Site 11	Site 11
	WELL I.D.:	KBA-11-5	KBA-11-6	KBA-11-7	KBA-11-8A	KBA-11-8B	KBA-11-8C
	SAMPLE I.D.:	05 GW 02	06 GW 02	07 GW 02	08A GW 02	08B GW 02	08C GW 02
	DATE SAMPLED:	04/07/94	04/07/94	04/07/94	04/06/94	04/06/94	04/06/94
INORGANIC TAL ANALYTE	**CRDL**						
Aluminum	200	64,100	6,060	12,100	35,700 J[1]	1,060 J[1]	5,630 J[1]
Antimony	5	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Arsenic	10	2.7 J[2,6]	1.0 U	1.0 U	3.1 J[2,6]	2.4 J[2,6]	2.0 J[2]
Barium	200	81.4 J[2]	13.4 J[2]	31.0 J[2]	40.2 J[2]	47.5 J[2]	45.8 J[2]
Beryllium	5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Cadmium	5	3.0 UJ[4]	3.0 UJ[4]	3.0 UJ[4]	3.7 J[2]	3.0 U	4.8 J[2]
Calcium	5,000	6,170	3,320 J[2]	2,780 J[2]	71,600	5,050	5,310
Chromium	10	63.9	6.3 J[2]	10.4	44.7	10.5	17.8
Cobalt	50	9.0 U	9.0 U	9.0 U	9.0 U	9.0 U	9.0 U
Copper	25	42.4	3.0 UJ[4]	16.9 J[2,4]	15.9 J[2]	3.0 U	11.8 J[2]
Iron	100	7,890	812	542	18,700	4,910	3,810
Lead	3	27.3 J[5]	3.4 J[5]	5.3 J[5]	9.6	1.0 U	3.6 J[7]
Magnesium	5,000	4,130 J[2]	950 J[2]	444 J[2]	13,100	2,180 J[2]	1,140 J[2]
Manganese	15	37.0	15.9	8.9 J[2]	196	43.6	20.6
Mercury	0.2	0.44	0.20 U	0.20 U	0.26	0.20 U	0.20 U
Nickel	40	12.0 U	12.0 U	12.0 U	17.2 U[3]	12.0 U	12.0 U
Potassium	5,000	2,940 J[2]	1,340 J[2]	1,410 J[2]	12,000	5,420	1,270 J[2]
Selenium	5	2.0 UJ[6]	2.0 U	2.5 J[2,8]	2.0 J[2,6]	2.0 U	2.0 U
Silver	10	3.0 UJ[4]	3.0 UJ[4]	3.0 UJ[4]	3.0 U	3.0 U	3.0 U
Sodium	5,000	2,810 J[2]	2,780 J[2]	5,150	18,400	43,700	7,420
Thallium	10	1.0 UJ[5]	1.0 UJ[5]	1.0 UJ[5]	1.0 U	1.0 U	1.0 U
Vanadium	50	46.8 J[2,4]	5.0 UJ[4]	5.0 UJ[4]	19.1 J[2]	5.0 U	6.6 J[2]
Zinc	20	164	18.8 U[3]	34.6 U[3]	30.5 U[3]	57.9	68.1
Sulfide	1,000	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U

See notes at end of table.

Table A-3 (Continued)
Validated Analytical Results of Inorganic Target Analyte List Analytes Detected in Groundwater Samples (µg/ℓ)

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	WELL LOCATION:	Background	Site 11	Site 11	Site 11	Site 11	Background	Background
	WELL I.D.:	KBA-11-9	KBA-11-10A	KBA-11-10A	KBA-11-10B	KBA-1-10C	KBA-11-11A	KBA-11-11C
	SAMPLE I.D.:	09 GW 02	10A GW 02	10A GW 02D	10B GW 02	10C GW 02	11A GW 01	11C GW 01
	DATE SAMPLED:	04/05/94	04/07/94	04/07/94	04/05/94	04/07/94	04/05/94	04/05/94
INORGANIC TAL ANALYTE	**CRDL**							
Aluminum	200	48,500 J[1]	37,500	12,600	23,300 J[1]	191 J[2]	2120 J[1]	269 J[1]
Antimony	5	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Arsenic	10	1.3 J[2]	2.4 J[2]	1.5 J[2]	15.7	1.0 J[2]	1.0 U	1.6 J[2]
Barium	200	51.0 J[2]	71.8 J[2]	52.1 J[2]	51.2 J[2]	20.6 J[2]	32.0 J[2]	21.0 J[2]
Beryllium	5	2.0 U	2.0 U	2.0 U	2.1 J[2]	2.0 U	2.0 U	2.0 U
Cadmium	5	3.0 U	3.0 UJ[4]	3.0 UJ[4]	3.0 U	3.0 UJ[4]	3.0 U	3.0 U
Calcium	5,000	10,700	67,600	66,100	2,190 J[2]	38,700	2,540 J[2]	30,600
Chromium	10	53.9	19.4	13.8	147	48.2	18.1	18.2
Cobalt	50	9.0 U	9.0 U	9.0 U	18.2 J[2]	9.0 U	9.0 U	9.0 U
Copper	25	14.3 J[2]	7.0 UJ[3,4]	7.5 UJ[3,4]	50.2	15.4 J[2,4]	10.7 J[2]	27.2
Iron	100	2,470	45,300	40,500	7,390	1,080	1,880	1,200
Lead	3	13.7	13.9 J[5]	2.0 J[2,5]	12.6	2.6 J[2,5]	1.0 U	4.7 J[7]
Magnesium	5,000	2,400 J[2]	17,700	16,100	6,850	2,880 J[2]	1,740 J[2]	2,590 J[2]
Manganese	15	9.9 J[2]	401	390	38.6	24.6	14.9 J[2]	49.0
Mercury	0.2	0.28	0.24	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	40	12.0 U	12.0 U	12.0 U	135	25.0 J[2]	19.8 U[3]	15.5 U[3]
Potassium	5,000	4,700 J[2]	10,100	9,140	18,300	3,060 J[2]	4,150 J[2]	3,370 J[2]
Selenium	5	2.1 J[2,6]	2.7 J[1,2,8]	2.7 J[2,9]	2.0 UJ[6]	2.0 U	2.0 U	2.0 U
Silver	10	6.4 J[2]	3.0 UJ[4]	3.0 UJ[4]	3.0 U	3.0 UJ[4]	3.0 U	3.0 U
Sodium	5,000	4,410 J[2]	10,500	9,500	20,800	9,820	15,200	40,600
Thallium	10	1.0 U	1.0 UJ[5]	1.0 J[2,5,7]	1.0 U	1.0 UJ[5]	1.0 U	1.0 U
Vanadium	50	25.3 J[2]	18.6 J[2,4]	10.3 J[2,4]	40.0 J[2]	5.0 UJ[4]	5.0 U	5.0 U
Zinc	20	18.3 U[3]	132	74.9 U[3]	96.3	42.5 U[3]	25.5 U[3]	33.6 U[3]
Sulfide	1,000	1,000 U	1,000 U	1,000 U	2,000	1,000 U	1,000 U	1000 U

See notes at end of table.

Table A-3 (Continued)
Validated Analytical Results of Inorganic Target Analyte List Analytes Detected in Groundwater Samples (µg/ℓ)

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	WELL LOCATION:	Site 11	Site 11	Site 11	Site 11	Subdivision	Subdivision
	WELL I.D.:	KBA-11-12	KBA-11-12	KBA-11-13B	KBA-11-14	KBA-11-15	KBA-11-17A
	SAMPLE I.D.:	12 GW 02	12 GW 02D	13B GW 02	14 GW 02	15 GW 02	17A GW 02
	DATE SAMPLED:	04/06/94	04/06/94	04/09/94	04/06/94	04/06/94	04/06/94
ORGANIC TAL ANALYTE	**CRDL**						
Aluminum	200	7,860	7,030	1,830	14,200 J[1]	21,800	68,100
Antimony	5	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Arsenic	10	14.9	15.2	1.0 U	12.3	19.5	5.2 J[2]
Barium	200	73.7 J[2]	63.2 J[2]	23.5 J[2]	70.1 J[2]	163 J[2]	524
Beryllium	5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Cadmium	5	3.0 UJ[4]	3.0 UJ[4]	3.0 U	3.0 U	3.0 UJ[4]	3.0 UJ[4]
Calcium	5,000	2,090 J[2]	1,680 J[2]	71,200	3,630 J[2]	34,200	38,600
Chromium	10	13.9	14.3	12.0	47.4	40.3	76.4
Cobalt	50	9.0 U	9.0 U	9.0 UJ[4]	9.0 U	9.0 U	9.0 J[2]
Copper	25	8.1 UJ[3,4]	10.7 J[2,4]	26.2	29.0	13.6 J[2,4]	35.9
Iron	100	6,040	5,730	1,900	11,500	10,000	17,300
Lead	3	4.0 J[5]	4.1 J[5]	1.0 J[2]	5.9 J[7]	7.3 J[5]	15.2 J[5]
Magnesium	5,000	1,690 J[2]	1,580 J[2]	12,200	2,040 J[2]	15,700	21,100
Manganese	15	27.1	26.0	51.2	28.1	63.6	64.4
Mercury	0.2	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	40	12.0 U	12.0 U	12.0 U	50.4 U[3]	12.0 U	22.1 J[2]
Potassium	5,000	1,360 J[2]	1,100 J[2]	2,240 J[2]	1,180 J[2]	5,310	4,070 J[2]
Selenium	5	2.0 U	2.0 U	2.0 U	2.0 U	11.9 J[1,8]	10.0 U
Silver	10	3.0 UJ[4]	3.0 UJ[4]	3.0 U	3.0 U	3.0 UJ[4]	3.0 UJ[4]
Sodium	5,000	8,540	7,680	9,950	18,100	198,000	112,000
Thallium	10	1.0 UJ[5]	1.0 UJ[5]	1.0 U	1.0 U	1.8 J[2,5]	1.1 J[2,5]
Vanadium	50	6.4 J[2,4]	6.0 J[2,4]	5.0 U	16.8 J[2]	19.6 J[2,4]	63.6 J[4]
Zinc	20	29.4 U[3]	41.0 U[3]	83.7 J[10]	56.8	36.8 U[3]	76.2 U[3]
Sulfide	1,000	1,000 U	1,000 U	1,000 U	1,000 U	2,000	1,000 U

See notes at end of table.

Table A-3 (Continued)
Validated Analytical Results of Inorganic Target Analyte List Analytes Detected in Groundwater Samples (µg/ℓ)

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	WELL LOCATION:	Subdivision	Subdivision	Subdivision	Subdivision	Subdivision	Subdivision
	WELL I.D.:	KBA-11-17A	KBA-11-17B	KBA-11-17C	KBA-11-18	KBA-11-19A	KBA-11-19B
	SAMPLE I.D.:	17A GW 02D	17B GW 02	17C GW 02	18 GW 02	19A GW 02	19B GW 02
	DATE SAMPLED:	04/06/94	04/07/94	04/06/94	04/06/94	04/07/94	04/06/94
INORGANIC TAL ANALYTE	**CRDL**						
Aluminum	200	66,700	3,920	195 J[2]	2,670	13,900	440
Antimony	5	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Arsenic	10	7.7 J[2]	6.6 J[2]	1.0 U	2.8 J[2]	4.7 J[2]	1.0 U
Barium	200	513	65.5 J[2]	22.9 J[2]	42.1 J[2]	57.4 J[2]	14.4 J[2]
Beryllium	5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Cadmium	5	3.0 UJ[4]	3.0 UJ[4]	3.0 UJ[4]	3.0 UJ[4]	3.0 UJ[4]	3.0 UJ[4]
Calcium	5,000	39,400	4,200 J[2]	16,800	2,850 J[2]	12,000	3,650 J[2]
Chromium	10	76.7	26.5	5.0 U	8.5 J[2]	35.2	5.0 U
Cobalt	50	13.9 J[2]	9.0 U	9.0 U	9.0 U	9.0 U	9.0 U
Copper	25	34.6 J[4]	39.1	34.7 J[4]	7.8 UJ[3,4]	29.9 J[4]	18.1 J[2,4]
Iron	100	16,700	3,380	970	2,180	4,900	1,170
Lead	3	10.4 J[5]	2.3 J[2,5]	1.6 J[2,5]	1.3 J[2,5]	4.3 J[5]	1.0 UJ[5]
Magnesium	5,000	21,300	1,780 J[2]	1,500 J[2]	1,470 J[2]	3,800 J[2]	738 J[2]
Manganese	15	62.2	21.7	20.7	13.8 J[2]	22.0	18.0
Mercury	0.2	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	40	12.9 J[2]	29.0 J[2]	12.0 U	12.0 U	26.0 J[2]	12.0 U
Potassium	5,000	3,800 J[2]	825 J[2]	849 J[2]	642 J[2]	2,400 J[2]	1,150 J[2]
Selenium	5	13.0 J[9]	2.0 U	2.0 UJ[6]	2.0 U	4.5 J[2,9]	2.0 UJ[6]
Silver	10	3.0 UJ[4]	3.0 UJ[4]	3.0 UJ[4]	3.0 UJ[4]	3.0 UJ[4]	3.0 UJ[4]
Sodium	5,000	113,000	14,700	7,790	10,200	5,540	8,550
Thallium	10	1.0 UJ[5]	1.0 UJ[5]	1.0 UJ[5]	1.0 UJ[5]	1.0 UJ[5]	1.0 UJ[5]
Vanadium	50	61.8 J[4]	5.0 UJ[4]	5.0 UJ[4]	5.0 UJ[4]	12.5 J[2,4]	5.0 UJ[4]
Zinc	20	66.9 U[3]	24.2 U[3]	50.5 U[3]	17.4 U[3]	44.7 U[3]	42.3 U[3]
Sulfide	1,000	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U

See notes at end of table.

Table A-3 (Continued)
Validated Analytical Results of Inorganic Target Analyte List Analytes Detected in Groundwater Samples (µg/ℓ)

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	WELL LOCATION:	Subdivision	Subdivision	Site 11	Site 11	Site 11
	WELL I.D.:	KBA-11-20	KBA-11-21	KBA-11-22A	KBA-11-22B	KBA-11-22B
	SAMPLE I.D.:	20 GW 02	21 GW 02	22A GW 02	22B GW 01	22B GW 02D
	DATE SAMPLED:	04/06/94	04/06/94	04/05/94	04/05/94	04/05/94
INORGANIC TAL ANALYTE	**CRDL**					
Aluminum	200	4,290	7,590	3,150 J[1]	450 J[1]	396 J[1]
Antimony	5	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Arsenic	10	2.9 J[2]	7.1 J[2]	1.2 J[2,6]	1.5 J[2,6]	1.4 J[2,6]
Barium	200	63.7 J[2]	198 J[2]	16.7 J[2]	25.7 J[2]	25.4 J[2]
Beryllium	5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Cadmium	5	3.0 UJ[4]	3.0 UJ[4]	3.0 U	3.0 U	3.0 U
Calcium	5,000	9,310	32,900	32,900	4,310 J[2]	3,380 J[2]
Chromium	10	40.6	16.5	20.1	9.1 J[2]	8.8 J[2]
Cobalt	50	9.0 U	9.0 U	9.0 U	9.0 U	9.0 U
Copper	25	20.3 J[2,4]	5.7 UJ[3,4]	8.4 J[2]	11.5 J[2]	5.4 J[2]
Iron	100	3,120	9,610	8,770	689	734
Lead	3	7.7 J[5]	3.4 J[5]	1.1 J[2]	1.3 J[2]	1.0 J[2,7]
Magnesium	5,000	4,730 J[2]	17,800	10,600	835 J[2]	800 J[2]
Manganese	15	29.2	69.3	129	12.1 J[2]	11.2 J[2]
Mercury	0.2	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	40	13.0 J[2]	12.0 U	12.0 U	13.7 U[3]	12.0 U
Potassium	5,000	1,040 J[2]	1,610 J[2]	11,800	17,200	17,300
Selenium	5	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Silver	10	3.0 UJ[4]	3.0 UJ[4]	3.0 U	3.0 U	3.0 U
Sodium	5,000	35,300	23,900	8,390	35,700	35,900
Thallium	10	1.0 UJ[5]	1.0 UJ[5]	1.0 U	1.0 U	1.0 U
Vanadium	50	5.0 UJ[4]	5.0 UJ[4]	5.0 U	5.5 J[2]	5.0 U
Zinc	20	38.4 U[3]	43.8 U[3]	19.0 U[3]	41.3	38.4
Sulfide	1,000	1,000 U	3,000	1,000 U	1,000 U	1,000 U

See notes at end of table.

Table A-3 (Continued)
Validated Analytical Results of Inorganic Target Analyte List Analytes Detected in Groundwater Samples (µg/ℓ)

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

[1] Sample values flagged "J" as estimated because serial dilutions were outside the control limits.
[2] Sample values flagged "J" as estimated because concentration is below the contract required detection limit.
[3] Elevated sample quantitation limit relative to the method detection limit due to preparation blank and/or field blank contamination.
[4] Sample quantitation limits and sample values flagged "UJ" and "J" as estimated due to preparation blank exhibiting negative bias.
[5] Sample quantitation limits and sample values flagged "UJ" and "J" as estimated because matrix spike recovery was below lower control limit.
[6] Sample quantitation limits and sample values flagged "UJ" and "J" as estimated due to low recovery during graphite furnace atomic absorption (GFAA) spiking procedures.
[7] Sample quantitation limits and sample values flagged "UJ" and "J" as estimated due to high recovery during GFAA spiking procedures.
[8] Sample values flagged "J" as estimated because analyses performed by the method of standard additions had coefficients of variation less than 0.995.
[9] Sample quantitation limits and sample values flagged "UJ" and "J" as estimated because matrix spike recovery was above the upper control limit.
[10] Sample quantitation limits and sample values flagged "UJ" and "J" as estimated because duplicate analyses were outside the control limits.

Notes: CRQL = contract required quantitation limit.
GFAA = graphite furnace atomic absorption.
I.D. = identification.
J = estimated value.
TAL = Target Analyte List.
UJ = not detected, but quantitation limit estimated per validation (as noted in footnotes).
UR = not detected, but quantitation limit rejected per validation (see footnote number 9).

APPENDIX B

ANALYTICAL DATA FOR JANUARY AND APRIL 1994 PRESENTED ACCORDING TO MONITORING WELL IDENTIFICATION

Table B-1
Analytes Detected in Groundwater Samples
Well KBA-11-1

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	–	1,590 J	16,700 J
Antimony	6	2.3 J	3.0 U
Barium	2,000	16.0 J	31.9 J
Calcium	–	1,520 J	2,790 J
Chromium	100	2.3 U	24.6
Copper	13,000	1.7 U	11.9 J
Iron	–	81.4 J	968
Lead	15	2.0 U	16.3
Magnesium	–	1,010 J	1,220 J
Manganese	–	5.8 J	8.2 J
Potassium	–	738 U	685 J
Sodium	–	5,360 J	9,090
Zinc	–	3.8 J	34.2 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
– = not applicable.
J = estimated value.
U = not detected.

Table B-2
Analytes Detected in Groundwater Samples
Well KBA-11-2

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTES (µg/ℓ)			
Vinyl chloride	2	25	33
Chloroethane	--	3	2 U
cis-1,2-Dichloroethene	70	5	10
Toluene	1,000	1 U	0.7 J
1,4-Dichlorobenzene	75	1 U	0.8 J
SEMIVOLATILE ANALYTE (µg/ℓ)			
bis(2-Ethylhexyl)phthalate	6	0.50 J	10 U
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	3,010 J	20,700 J
Antimony	6	3.4 J	3.0 U
Arsenic	50	1.0 U	2.3 J
Barium	2,000	4.6 J	28.5 J
Calcium	--	55,600 J	48,700
Chromium	100	3.1 U	26.5
Copper	13,000	5.8 U	4.1 J
Iron	--	621 J	3,550
Lead	15	2.0 U	19.2
Magnesium	--	4,270 J	3,870 J
Manganese	--	22.3	24.6
Potassium	--	6,260	3,760 J
Sodium	--	9,410 J	7,130
Vanadium	--	2.8 J	6.0 J

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.

Table B-3
Analytes Detected in Groundwater Samples
Well KBA-11-3A

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTES (µg/ℓ)			
2-Butanone	--	38 J	5 UR
Toluene	1,000	0.40 J	1 U
Chlorobenzene	--	1 U	3
1,4-Dichlorobenzene	75	6	7
SEMIVOLATILE ANALYTES (µg/ℓ)			
1,4-Dichlorobenzene	75	8 J	8 J
Diethylphthalate	--	10 U	0.6 J
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	12,300 J	12,200 J
Arsenic	50	1.9 J	1.0 U
Barium	2,000	12.4 J	24.2 J
Calcium	--	241,000 J	230,000
Chromium	100	5.0 J	5.6 J
Copper	13,000	12.3 J	3.0 U
Iron	--	3,480 J	5,870
Lead	15	2.0 U	4.1
Magnesium	--	8,160	7,710
Manganese	--	302	371
Potassium	--	3,780 J	3,710 J
Sodium	--	5,640 J	5,890
Vanadium	--	6.2 J	5.0 U
Sulfide	--	200 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UR = not detected, quantitation limit rejected because quality control criteria were not met.

Table B-4
Analytes Detected in Groundwater Samples
Well KBA-11-3B

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTES (µg/ℓ)			
Vinyl chloride	2	1	1 U
Carbon disulfide	--	10	1 U
cis-1,2-Dichloroethene	70	12	18
Trichloroethene	5	1 U	0.6 J
Benzene	5	4	6
4-Methyl-2-pentanone	--	5 U	0.9 J
Toluene	1,000	1	0.8 J
Chlorobenzene	--	0.80 J	1 U
Ethylbenzene	700	14	9
Xylene (total)	10,000	4	2
SEMIVOLATILE ANALYTE (µg/ℓ)			
Diethylphthalate	--	10	8 J
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	5,660 J	13,100 J
Arsenic	50	2.3 J	10.9
Barium	2,000	4.9 J	99.1 J
Calcium	--	85,100 J	1,620 J
Chromium	100	3.6 J	73.1
Cobalt	--	2.1 U	9.6 J
Copper	13,000	3.3 U	21.3 J
Iron	--	160 J	9,200
Lead	15	2.0 U	8.1
Magnesium	--	2,880 J	793 J
Manganese	--	25.3	59.9
Nickel	100	3.9 U	46.6
Potassium	--	1,180 J	8,360
Sodium	--	3,140 J	34,700
Vanadium	--	2.2 J	18.4 J
Zinc	--	4.3 U	57.8
Sulfide	--	1,800 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.

Table B-5
Analytes Detected in Groundwater Samples
Well KBA-11-3C

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
SEMIVOLATILE ANALYTES (µg/ℓ)			
Di-n-butylphthalate	–	4 J	10 U
bis(2-Ethylhexyl)phthalate	6	3 J	10 U
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	–	130 J	162 J
Antimony	6	2.1 J	3.0 U
Arsenic	50	5.8 J	1.0 U
Barium	2,000	19.8 J	11.4 J
Calcium	–	62,300	50,100
Chromium	100	2.6 U	8.7 J
Cobalt	–	1.6 U	10.3 J
Copper	13,000	4.6 J	3.2 J
Iron	–	193	194 U
Lead	15	3.4	1.0 U
Magnesium	–	12,200	6,640
Manganese	-	12.8 J	7.2 J
Mercury	2	0.35	0.20 U
Potassium	–	12,000	8,000
Sodium	–	22,100 J	25,400
Zinc	–	18.0 J	11.4 U
Sulfide	–	200 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
– = not applicable.
J = estimated value.
U = not detected.

Table B-6
Analytes Detected in Groundwater Samples
Well KBA-11-4

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	5670 J	2,960
Arsenic	50	1.2 J	1.2 J
Barium	2,000	5.1 J	6.7 J
Cadmium	5	3.5 J	3.0 UJ
Calcium	--	85,800 J	125,000
Chromium	100	5.7 J	5.0 U
Iron	--	161 J	388
Magnesium	--	2,870 J	3,480 J
Manganese	--	25.5	39.7
Potassium	--	1,180 J	1,850 J
Sodium	--	3,120 J	3,840 J
Vanadium	--	3.1 J	5.0 UJ

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-7
Analytes Detected in Groundwater Samples
Well KBA-11-5

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
SEMIVOLATILE ANALYTE (µg/ℓ)			
4-Methylphenol	--	1 J	10 U
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	8970 J	64,100
Arsenic	50	1.0 U	2.7 J
Barium	2,000	5.2 J	81.4 J
Calcium	--	5,840 J	6,170
Chromium	100	3.1 U	63.9
Copper	13,000	26.7	42.4
Iron	--	632 J	7,890
Lead	15	2.0 U	27.3 J
Magnesium	--	1,950 J	4,130 J
Manganese	--	13.1 J	37.0
Mercury	2	0.13 U	0.44
Nickel	100	5.3 J	12.0 U
Potassium	--	964 J	2,940 J
Sodium	--	1,390 J	2,810 J
Vanadium	--	4.1 J	46.8 J
Zinc	--	69.3	164
Sulfide	--	200 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.

Table B-8
Analytes Detected in Groundwater Samples
Well KBA-11-6

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTE (µg/ℓ)			
1,4-Dichlorobenzene	75	1 U	0.5 J
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	2,380 J	6,060
Barium	2,000	8.9 J	13.4 J
Beryllium	4	0.19 J	2.0 U
Calcium	--	1,690 J	3,320 J
Chromium	100	2.3 U	6.3 J
Copper	13,000	1.9 J	3.0 UJ
Iron	--	216	812
Lead	15	2.0 U	3.4 J
Magnesium	--	457 J	950 J
Manganese	--	7.9 J	15.9
Potassium	--	1,030 J	1,340 J
Sodium	--	1,780 J	2,780 J
Zinc	--	4.7 J	18.8 U
Sulfide	--	200 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-9
Analytes Detected in Groundwater Samples
Well KBA-11-7

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	28,700 J	12,100
Antimony	6	10.5	3.0 U
Barium	2,000	15.7 J	31.0 J
Beryllium	4	0.43 J	2.0 U
Calcium	--	1,620 J	2,780 J
Chromium	100	17.2	10.4
Copper	13,000	2.3 J	16.9 J
Iron	--	331	542
Lead	15	2.0 UJ	5.3 J
Magnesium	--	345 J	444 J
Manganese	--	5.4 J	8.9 J
Potassium	--	738 U	1,410 J
Selenium	50	1.5 U	2.5 J
Sodium	--	3,940 J	5,150
Vanadium	--	5.6 J	5.0 UJ
Zinc	--	34.0	34.6 U
Sulfide	--	200 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-10
Analytes Detected in Groundwater Samples
Well KBA-11-8A

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	1,810 J	35,700 J
Antimony	6	2.8 J	3.0 U
Arsenic	50	2.4 J	3.1 J
Barium	2,000	8.5 J	40.2 J
Cadmium	5	3.1 U	3.7 J
Calcium	--	72,200	71,600
Chromium	100	2.3 U	44.7
Copper	13,000	1.7 U	15.9 J
Iron	--	2,700	18,700
Lead	15	2.5 J	9.6
Magnesium	--	8,220	13,100
Manganese	--	170	196
Mercury	2	0.13 U	0.26
Potassium	--	9,970	12,000
Selenium	50	1.5 U	2.0 J
Sodium	--	19,200 J	18,400
Vanadium	--	2.3 U	19.1 J
Zinc	--	5.9 J	30.5 U
Sulfide	--	200 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.

Table B-11
Analytes Detected in Groundwater Samples
Well KBA-11-8B

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTES (µg/ℓ)			
1,1-Dichloroethane	--	3	3
cis-1,2-Dichloroethene	70	2	2
Trichloroethene	5	0.90 J	1
Benzene	5	0.40 J	0.5 J
4-Methyl-2-pentanone	--	3 J	1 J
Ethylbenzene	700	0.90 J	2
SEMIVOLATILE ANALYTE (µg/ℓ)			
Diethylphthalate	--	1 J	1 J
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	1,310 J	1,060 J
Arsenic	50	1.3 U	2.4 J
Barium	2,000	36.9 J	47.5 J
Beryllium	4	0.18 J	2.0 U
Calcium	--	5,370	5,050
Chromium	100	4.4 J	10.5
Iron	--	10,300	4,910
Magnesium	--	2,470 J	2,180 J
Manganese	--	73.6	43.6
Potassium	--	3,130 J	5,420
Sodium	--	50,400 J	43,700
Vanadium	--	4.2 J	5.0 U
Zinc	--	9.8 J	57.9
Sulfide	--	1,600 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.

Table B-12
Analytes Detected in Groundwater Samples
Well KBA-11-8C

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
SEMIVOLATILE ANALYTES (µg/ℓ)			
Diethylphthalate	--	10 U	0.8 J
bis(2-Ethylhexyl)phthalate	6	2 J	10 U
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	1,910 J	5,630 J
Arsenic	50	1.0 UJ	2.0 J
Barium	2,000	36.1 J	45.8 J
Beryllium	4	0.25 J	2.0 U
Cadmium	5	3.2 U	4.8 J
Calcium	--	2,300 J	5,310
Chromium	100	10.9	17.8
Copper	13,000	3.8 U	11.8 J
Iron	--	2,050	3,810
Lead	15	4.3 J	3.6 J
Magnesium	--	962 J	1,140 J
Manganese	--	17.9	20.6
Potassium	--	784 U	1,270 J
Sodium	--	7,000 J	7,420
Vanadium	--	2.1 J	6.6 J
Zinc	--	11.0 UJ	68.1
Sulfide	--	1,000 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-13
Analytes Detected in Groundwater Samples
Well KBA-11-9

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
SEMIVOLATILE ANALYTE (µg/ℓ)			
Diethylphthalate	--	10 U	0.5 J
PESTICIDE AND PCB ANALYTE (µg/ℓ)			
gamma-BHC	--	0.050 UJ	0.008 NJ
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	28,900 J	48,500 J
Arsenic	50	1.3 U	1.3 J
Barium	2,000	10.8 J	51.0 J
Beryllium	4	0.94 J	2.0 U
Calcium	--	8,030	10,700
Chromium	100	12.5	53.9
Cobalt	--	2.2 J	9.0 U
Copper	13,000	4.6 J	14.3 J
Iron	--	563	2,470
Lead	15	2.0 U	13.7
Magnesium	--	1,100 J	2,400 J
Manganese	--	1.5 J	9.9 J
Mercury	2	0.13 U	0.28
Nickel	100	16.8 J	12.0 U
Potassium	--	5,310	4,700 J
Selenium	50	1.5 U	2.1 J
Silver	--	2.6 J	6.4 J
Sodium	--	3,100 J	4,410 J
Vanadium	--	17.4 J	25.3 J
Zinc	--	16.0 J	18.3 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.
NJ = presumptive evidence for presence of compound at an estimated concentration.

Table B-14
Analytes Detected in Groundwater Samples
Well KBA-11-10A

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94	4/94 DUPLICATE
VOLATILE ANALYTES (µg/ℓ)				
Carbon disulfide	--	0.80 J	1 U	1 U
Benzene	5	0.40 J	0.4 J	0.5 J
Chlorobenzene	--	1 U	1	2
1,4-Dichlorobenzene	75	1 U	4	4
SEMIVOLATILE ANALYTES (µg/ℓ)				
1,4-Dichlorobenzene	75	3 J	3 J	3 J
Naphthalene	--	2 J	3 J	3 J
2-Methylnaphthalene	--	0.60 J	0.5 J	0.5 J
Diethylphthalate	--	10 U	0.5 J	0.5 J
bis(2-Ethylhexyl)phthalate	6	6 J	10 U	10 U
INORGANIC ANALYTES (µg/ℓ)				
Aluminum	--	10,100 J	37,500	12,600
Arsenic	50	2.8 J	2.4 J	1.5 J
Barium	2,000	61.1 J	71.8 J	52.1 J
Calcium	--	73,900 J	67,600	66,100
Chromium	100	2.9 U	19.4	13.8
Iron	--	41,800 J	45,300	40,500
Lead	15	2.0 U	13.9 J	2.0 J
Magnesium	--	16,600	17,700	16,100
Manganese	--	415	401	390
Mercury	2	0.13 U	0.24	0.20 U
Potassium	--	10,500	10,100	9,140
Selenium	50	1.5 UJ	2.7 J	2.7 J
Sodium	--	10,300 J	10,500	9,500
Thallium	2	1.3 UJ	1.0 UJ	1.0 J
Vanadium	--	4.6 J	18.6 J	10.3 J
Zinc	--	51.0	132	74.9 U
Sulfide	--	200 J	1,000 U	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-15
Analytes Detected in Groundwater Samples
Well KBA-11-10B

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTES (µg/ℓ)			
Carbon disulfide	–	3	1 U
1,1-Dichloroethane	–	0.80 J	0.6 J
cis-1,2-Dichloroethene	70	4	2
Benzene	5	2	1
Toluene	1,000	0.50 J	0.7 J
Chlorobenzene	–	2	1
Ethylbenzene	700	19	12
Xylene (total)	10,000	0.40 J	3
1,4-Dichlorobenzene	75	2	2
SEMIVOLATILE ANALYTES (µg/ℓ)			
Phenol	–	10 U	0.8 J
1,4-Dichlorobenzene	75	2 J	2 J
Naphthalene	–	3 J	3 J
Diethylphthalate	–	6 J	4 J
bis(2-Ethylhexyl)phthalate	6	1 J	10 U
PESTICIDE AND PCB ANALYTE (µg/ℓ)			
alpha-Chlordane	–	0.050 UJ	0.01 J
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	–	3,750 J	23,300 J
Arsenic	50	3.4 J	15.7
Barium	2,000	21.0 J	51.2 J
Beryllium	4	0.12 UJ	2.1 J
Calcium	–	1,950 J	2,190 J
Chromium	100	13.7	147
Cobalt	–	2.1 U	18.2 J
Copper	13,000	6.2 U	50.2
Iron	–	1,460 J	7,390
Lead	15	2.1 J	12.6
Magnesium	–	6,410	6,850
Manganese	–	8.2 J	38.6
Nickel	100	11.1 J	135

See notes at the end of table.

Table B-15 (continued)
Analytes Detected in Groundwater Samples
Well KBA-11-10B

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
Potassium	--	19,200	18,300
Sodium	--	21,100 J	20,800
Vanadium	--	12.1 J	40.0 J
Zinc	--	24.6	96.3
Sulfide	--	900 J	2,000

Notes: MCL = Maximum Contaminant Level.
$\mu g/\ell$ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-16
Analytes Detected in Groundwater Samples
Well KBA-11-10C

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTE (µg/ℓ)			
Carbon disulfide	–	2	1 U
SEMIVOLATILE ANALYTES (µg/ℓ)			
Phenol	–	10 U	0.9 J
bis(2-Ethylhexyl)phthalate	6	0.90 J	10 U
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	–	191 J	191 J
Arsenic	50	1.3 J	1.0 J
Barium	2,000	52.5 J	20.6 J
Calcium	–	42,200 J	38,700
Chromium	100	5.0 J	48.2
Copper	13,000	16.5 J	15.4 J
Iron	–	2,370 J	1,080
Lead	15	6.8	2.6 J
Magnesium	–	4,600 J	2,880 J
Manganese	–	58.6	24.6
Nickel	100	20.3 J	25.0 J
Potassium	–	3,000 J	3,060 J
Sodium	–	9,820 J	9,820
Zinc	–	44.8	42.5 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
– = not applicable.
J = estimated value.
U = not detected.

Table B-17
Analytes Detected in Groundwater Samples
Well KBA-11-11A

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	1/94 DUPLICATE	4/94
SEMIVOLATILE ANALYTE (µg/ℓ)				
bis(2-Ethylhexyl)phthalate	6	10 U	0.50 J	10 U
INORGANIC ANALYTES (µg/ℓ)				
Aluminum	--	569 J	576 J	2120 J
Arsenic	50	1.0 UJ	1.8 J	1.0 U
Barium	2,000	35.9 J	34.4 J	32.0 J
Beryllium	4	0.16 J	0.12 J	2.0 U
Calcium	--	3,550 J	3,470 J	2,540 J
Chromium	100	6.9 J	5.2 J	18.1
Copper	13,000	14.9 J	7.8 U	10.7 J
Iron	--	5,140	5,540	1,880
Lead	15	8.1 J	3.3 J	1.0 U
Magnesium	--	2,820 J	2,870 J	1,740 J
Manganese	--	44.5	47.6	14.9 J
Nickel	100	9.0 J	7.2 J	19.8 U
Potassium	--	3,760 J	3,600 J	4,150 J
Sodium	--	17,000 J	17,300 J	15,200
Zinc	--	62.4 J	32.7 UJ	25.5 U
Sulfide	--	1,600 J	1,500 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-18
Analytes Detected in Groundwater Samples
Well KBA-11-11B

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
INORGANIC ANALYTES (µg/ℓ)			
Arsenic	50	1.0 UJ	8.0
Barium	2,000	45.0 J	81 J
Beryllium	4	0.51 J	5.0 U
Chromium	100	9.7 J	41
Copper	13,000	19.1 J	18
Lead	15	3.4	9.6 J
Nickel	100	8.4 J	40 U
Vanadium	--	1.9 J	50 U
Tin	--	28.4 U	59 J
Sulfide	--	200 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-19
Analytes Detected in Groundwater Samples
Well KBA-11-11C

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
SEMIVOLATILE ANALYTES (µg/ℓ)			
Butylbenzylphthalate	100	2 J	10 U
Diethylphthalate	–	10 U	0.8 J
Dimethylphthalate	–	2 J	10 U
bis(2-Ethylhexyl)phthalate	6	5 J	12
PESTICIDE AND PCB ANALYTE (µg/ℓ)			
Aldrin	–	0.050 UJ	0.006 NJ
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	–	578 J	269 J
Antimony	6	23.0 J	3.0 U
Arsenic	50	1.0 UJ	1.6 J
Barium	2,000	20.8 J	21.0 J
Calcium	–	64,800	30,600
Chromium	100	15.0	18.2
Copper	13,000	24.6 J	27.2
Iron	–	1,130	1,200
Lead	15	5.1 J	4.7 J
Magnesium	–	5,750	2,590 J
Manganese	–	108	49.0
Nickel	100	13.0 J	15.5 U
Potassium	–	2,340 U	3,370 J
Sodium	–	28,200 J	40,600
Vanadium	–	1.6 J	5.0 U
Sulfide	–	200 J	1000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
– = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.
NJ = presumptive evidence for presence of compound at an estimated concentration.

Table B-20
Analytes Detected in Groundwater Samples
Well KBA-11-12

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	1/94 DUPLICATE	4/94	4/94 DUPLICATE
INORGANIC ANALYTES (µg/ℓ)					
Aluminum	--	3,930 J	4,160 J	7,860	7,030
Arsenic	50	2.7 J	1.3 U	14.9	15.2
Barium	2,000	31.8 J	33.3 J	73.7 J	63.2 J
Beryllium	4	0.21 J	0.21 J	2.0 U	2.0 U
Calcium	--	1,510 J	1,500 J	2,090 J	1,680 J
Chromium	100	8.2 J	5.8 J	13.9	14.3
Cobalt	--	2.8 J	2.2 J	9.0 U	9.0 U
Copper	13,000	3.1 J	3.8 J	8.1 UJ	10.7 J
Iron	--	3,810	3,800	6,040	5,730
Lead	15	2.0 U	2.0 U	4.0 J	4.1 J
Magnesium	--	1,350 J	1,360 J	1,690 J	1,580 J
Manganese	--	20.2	20.2	27.1	26.0
Nickel	100	7.3 U	7.4 J	12.0 U	12.0 U
Potassium	--	738 U	738 U	1,360 J	1,100 J
Sodium	--	8,740 J	8,660 J	8,540	7,680
Vanadium	--	3.5 J	2.6 J	6.4 J	6.0 J
Zinc	--	13.7 J	13.3 J	29.4 U	41.0 U
Sulfide	--	400 J	200 J	1,000 U	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-21
Analytes Detected in Groundwater Samples
Well KBA-11-13A

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTES (µg/ℓ)			
Vinyl chloride	2	170 J	110 J
Trichloroethene	5	300	2,400
Tetrachloroethene	5	100 U	580
cis-1,2-Dichloroethene	70	2,900[1]	1,800
Toluene	1,000	170	89
Ethylbenzene	700	130	120
Xylenes (total)	10,000	240	200
SEMIVOLATILE ANALYTES (µg/ℓ)			
Phenol	--	10 U	10 U
2- Methylphenol	--	5 J	1.5 J
2,4-Dimethylphenol	--	54	19
Naphthalene	--	34	47
Diethylphthalate	--	13	7.1 J
Di-n-butylphthalate	--	13 U	1.1 J
bis(2-Ethylhexyl)phthalate	6	4 J	24
3- & 4-Methylphenol	--	54	12[2]
INORGANIC ANALYTES (µg/ℓ)			
Antimony	6	2.4 J	6.0 U
Arsenic	50	3.9 J	8.6
Barium	2,000	30.6 J	70 J
Chromium	100	8.1 J	47
Copper	13,000	4.5 J	20
Lead	15	2.0 U	4.4 J
Nickel	100	17.0 J	40 U
Vanadium	--	14.4 J	50 U
Zinc	--	56.0	73 J
Sulfide	--	900 J	1,000 U

[1] Value is total concentration of cis- and trans-1,2-dichloroethene.
[2] Value is concentration of 4-methylphenol.

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-22
Analytes Detected in Groundwater Samples
Well KBA-11-13B

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
SEMIVOLATILE ANALYTE (µg/ℓ)			
bis(2-Ethylhexyl)phthalate	6	2 J	80
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	1,390 J	1,830
Antimony	6	3.3 J	3.0 U
Arsenic	50	1.6 J	1.0 U
Barium	2,000	22.6 J	23.5 J
Calcium	--	69,700 J	71,200
Chromium	100	3.2 U	12.0
Copper	13,000	45.4	26.2
Iron	--	944 J	1,900
Lead	15	4.4	1.0 J
Magnesium	--	9,870	12,200
Manganese	--	25.4	51.2
Potassium	--	5,690	2,240 J
Sodium	--	10,500 J	9,950
Vanadium	--	2.8 J	5.0 U
Zinc	--	23.9	83.7 J

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.

Table B-23
Analytes Detected in Groundwater Samples
Well KBA-11-14

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
PESTICIDE AND PCB ANALYTE (µg/ℓ)			
beta-BHC	–	0.050 UJ	0.084 J
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	–	6,900 J	14,200 J
Arsenic	50	1.3 U	12.3
Barium	2,000	51.7 J	70.1 J
Beryllium	4	0.45 J	2.0 U
Calcium	–	3,960 J	3,630 J
Chromium	100	25.2	47.4
Cobalt	–	7.0 J	9.0 U
Copper	13,000	20.6 J	29.0
Iron	–	7,390	11,500
Lead	15	2.0 U	5.9 J
Magnesium	–	2,030 J	2,040 J
Manganese	–	38.3	28.1
Nickel	100	48.4	50.4 U
Potassium	–	738 U	1,180 J
Sodium	–	20,500 J	18,100
Vanadium	–	9.8 J	16.8 J
Zinc	–	75.0	56.8
Sulfide	–	300 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
– = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-24
Analytes Detected in Groundwater Samples
Well KBA-11-15

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
SEMIVOLATILE ANALYTE (µg/ℓ)			
bis(2-Ethylhexyl)phthalate	6	20	10 U
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	731 J	21,800
Arsenic	50	1.3 U	19.5
Barium	2,000	68.1 J	163 J
Calcium	--	33,500	34,200
Chromium	100	30.7	40.3
Copper	13,000	7.1 J	13.6 J
Iron	--	1,570	10,000
Lead	15	5.4 J	7.3 J
Magnesium	--	16,500	15,700
Manganese	--	12.7 J	63.6
Nickel	100	14.2 J	12.0 U
Potassium	--	3,790 J	5,310
Selenium	50	1.5 U	11.9 J
Sodium	--	218,000 J	198,000
Thallium	2	1.3 UJ	1.8 J
Vanadium	--	2.3 U	19.6 J
Zinc	--	9.4 J	36.8 U
Sulfide	--	1,200 J	2,000

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-25
Analytes Detected in Groundwater Samples
Well KBA-11-16

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94[1]	4/94[2]
VOLATILE ANALYTES (µg/ℓ)			
Methylene chloride	5	7	11
Acetone	–	320 J	84
Carbon disulfide	–	2	8.4 U
1,1-Dichloroethene	7	0.70 J	8.4 U
1,1-Dichloroethane	–	13	11
cis-1,2-Dichloroethene	70	7	4 J
2-Butanone	–	380 J	200
1,2-Dichloropropane	5	0.80 J	8.4 U
Trichloroethene	5	0.60 J	8.4 U
Benzene	5	2	8.4 U
4-Methyl-2-pentanone	–	270	290
2-Hexanone	–	6 J	84 U
Toluene	1,000	23	24
Ethylbenzene	700	5	8.4 U
Xylenes (total)	10,000	12	5.4 J
SEMIVOLATILE ANALYTES (µg/ℓ)			
Phenol	–	100	40
2-Methylphenol	–	8 J	10 U
4-Methylphenol	–	670	270
Diethylphthalate	–	8 J	10 U
bis(2-Ethylhexyl)phthalate	6	4 J	10 U
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	–	2,550 J	NA
Arsenic	50	4.3 J	6.1
Barium	2,000	70 .4 J	61 J
Calcium	–	5,120 J	NA
Chromium	100	8.7 J	22
Copper	13,000	6.8 U	39
Iron	–	2,020 J	NA
Magnesium	–	5,680	NA
Manganese	–	18.2	NA
Nickel	100	7.5 J	40 U
Potassium	–	3,980 J	NA
Sodium	–	63,200 J	NA
Vanadium	–	2.2 J	50 U
Sulfide	–	5,300 J	4,000

See notes at end of table.

Table B-25 (continued)
Analytes Detected in Groundwater Samples
Well KBA-11-16

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

[1] Analyses were for Appendix IX constituents listed in Title 40, Code of Federal Regulations, Part 264, using SW-846 analytical methods.
[2] Analyses were for target compound list and target analyte list analytes using U.S. Environmental Protection Agency Contract Laboratory Program analytical methods.

Notes: MCL = Maximum Contaminant Level.
$\mu g/\ell$ = microgram(s) per liter.
– = not applicable.
J = estimated value.
U = not detected.
NA = not analyzed.

Table B-26
Analytes Detected in Groundwater Samples
Well KBA-11-17A

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94	4/94 DUPLICATE
INORGANIC ANALYTES (µg/ℓ)				
Aluminum	--	57,800 J	68,100	66,700
Antimony	6	1.9 J	3.0 U	3.0 U
Arsenic	50	2.1 J	5.2 J	7.7 J
Barium	2,000	432 J	524	513
Beryllium	4	0.74 J	2.0 U	2.0 U
Calcium	--	50,100	38,600	39,400
Chromium	100	18.6	76.4	76.7
Cobalt	--	3.6 J	9.0 J	13.9 J
Copper	13,000	9.6 J	35.9	34.6 J
Iron	--	3,690	17,300	16,700
Lead	15	2.0 U	15.2 J	10.4 J
Magnesium	--	26,700	21,100	21,300
Manganese	--	19.9	64.4	62.2
Nickel	100	16.6 J	22.1 J	12.9 J
Potassium	--	738 U	4,070 J	3,800 J
Selenium	50	15.2 U	10.0 U	13.0 J
Sodium	--	152,000 J	112,000	113,000
Thallium	2	1.3 UJ	1.1 J	1.0 UJ
Vanadium	--	18.2 J	63.6 J	61.8 J
Zinc	--	28.8	76.2 U	66.9 U
Sulfide	--	200 J	1,000 U	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-27
Analytes Detected in Groundwater Samples
Well KBA-11-17B

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	1/94 DUPLICATE	4/94
VOLATILE ANALYTES (µg/ℓ)				
Chloromethane	--	0.60 J	1 U	1 U
Acetone	--	100 J	14 UR	7 UR
Methylene chloride	5	3 U	2 U	0.5 J
Carbon disulfide	--	0.70 J	1 U	1 U
1,1-Dichloroethane	--	1	1 U	1 U
2-Butanone	--	61 J	5 UR	5 UR
Benzene	5	0.50 J	1 U	1 U
4-Methyl-2-pentanone	--	78	10	6
SEMIVOLATILE ANALYTES (µg/ℓ)				
Phenol	--	10 U	10 U	2 J
4-Methylphenol	--	3 J	4 J	4 J
bis(2-Ethylhexyl)phthalate	6	29	12	10 U
INORGANIC ANALYTES (µg/ℓ)				
Aluminum	--	1,460 J	1,700 J	3,920
Arsenic	50	6.3 J	6.4 J	6.6 J
Barium	2,000	39.9 J	40.0 J	65.5 J
Beryllium	4	0.12 UJ	0.19 J	2.0 U
Calcium	--	3,220 J	3,560 J	4,200 J
Chromium	100	7.8 J	7.9 J	26.5
Copper	13,000	16.5 J	14.6 J	39.1
Iron	--	1,590 J	1,670 J	3,380
Lead	15	2.0 U	2.0 U	2.3 J
Magnesium	--	1,540 J	1,600 J	1,780 J
Manganese	--	8.6 J	9.1 J	21.7
Nickel	100	6.3 J	7.3 J	29.0 J
Potassium	--	1,080 J	1,260 J	825 J
Sodium	--	13,100 J	13,700 J	14,700
Sulfide	--	200 J	200 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.
UR = not detected, quantitation limit rejected because quality control criteria were not met.

Table B-28
Analytes Detected in Groundwater Samples
Well KBA-11-17C

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
SEMIVOLATILE ANALYTE (µg/ℓ)			
bis(2-Ethylhexyl)phthalate	6	2 J	8 J
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	94.8 J	195 J
Antimony	6	6.1	3.0 U
Arsenic	50	5.2 J	1.0 U
Barium	2,000	21.2 J	22.9 J
Calcium	--	35,300	16,800
Copper	13,000	5.2 J	34.7 J
Iron	--	1,250	970
Lead	15	2.0 U	1.6 J
Magnesium	--	4,620 J	1,500 J
Manganese	--	35.2	20.7
Potassium	--	738 U	849 J
Sodium	--	8,370 J	7,790
Zinc	--	29.6	50.5 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.

Table B-29
Analytes Detected in Groundwater Samples
Well KBA-11-18

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTES (µg/ℓ)			
1,1-Dichloroethane	--	0.60 J	1 U
4-Methyl-2-pentanone	--	34	10
SEMIVOLATILE ANALYTE (µg/ℓ)			
bis(2-Ethylhexyl)phthalate	6	10 U	15
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	12,600 J	2,670
Arsenic	50	4.5 J	2.8 J
Barium	2,000	86.3 J	42.1 J
Beryllium	4	2.0 J	2.0 U
Calcium	--	7,070	2,850 J
Chromium	100	44.5	8.5 J
Cobalt	--	8.6 J	9.0 U
Copper	13,000	26.0	7.8 UJ
Iron	--	9,250	2,180
Lead	15	12.1	1.3 J
Magnesium	--	2,490 J	1,470 J
Manganese	--	45.9	13.8 J
Nickel	100	54.3	12.0 U
Potassium	--	738 U	642 J
Selenium	50	1.8 J	2.0 U
Sodium	--	10,600 J	10,200
Vanadium	--	18.6 J	5.0 UJ
Zinc	--	70.1	17.4 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-30
Analytes Detected in Groundwater Samples
Well KBA-11-19A

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94[1]	4/94[2]
VOLATILE ANALYTE (µg/ℓ)			
cis-1,2-Dichloroethene	70	5 U	0.8 J
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	NA	13,900
Arsenic	50	1.3 J	4.7 J
Barium	2,000	114 J	57.4 J
Beryllium	4	0.63 J	2.0 U
Calcium	--	NA	12,000
Chromium	100	69.0	35.2
Cobalt	--	11.5 J	9.0 U
Copper	13,000	115	29.9 J
Iron	--	NA	4,900
Lead	15	2.0 U	4.3 J
Magnesium	--	NA	3,800 J
Manganese	--	NA	22.0
Nickel	100	55.6	26.0 J
Potassium	--	NA	2,400 J
Selenium	50	1.5 U	4.5 J
Sodium	--	NA	5,540
Tin	--	9.0 J	NA
Vanadium	--	30.2 J	12.5 J
Zinc	--	84.3	44.7 U
Sulfide	--	1,100 J	1,000 U

[1] Analyses were for Appendix IX constituents listed in Title 40, Code of Federal Regulations, Part 264, using SW-846 analytical methods.

[2] Analyses were for target compound list and target analyte list analytes using the U.S. Environmental Protection Agency, Contract Laboratory Program analytical methods.

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
NA = not analyzed.

Table B-31
Analytes Detected in Groundwater Samples
Well KBA-11-19B

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTES (µg/ℓ)			
Acetone	--	5 UR	120 J
cis-1,2-Dichloroethene	70	0.70 J	1 U
SEMIVOLATILE ANALYTE (µg/ℓ)			
Di-n-butylphthalate	--	4 J	10 U
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	104 J	440
Antimony	6	2.2 J	3.0 U
Barium	2,000	10.0 J	14.4 J
Calcium	--	4,450 J	3,650 J
Copper	13,000	3.1 J	18.1 J
Iron	--	1,060	1,170
Magnesium	--	811 J	738 J
Manganese	--	16.9	18.0
Potassium	--	738 U	1,150 J
Sodium	--	8,150 J	8,550
Zinc	--	7.0 J	42.3 U
Sulfide	--	200 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UR = not detected, quantitation limit rejected because quality control criteria were not met.

Table B-32
Analytes Detected in Groundwater Samples
Well KBA-11-20

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
SEMIVOLATILE ANALYTE (µg/ℓ)			
bis(2-Ethylhexyl)phthalate	6	1 J	10 U
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	265 J	4,290
Arsenic	50	2.8 J	2.9 J
Barium	2,000	39.0 J	63.7 J
Beryllium	4	0.22 J	2.0 U
Calcium	--	7,750	9,310
Chromium	100	2.6 U	40.6
Copper	13,000	1.7 U	20.3 J
Iron	--	2,880	3,120
Lead	15	2.0 J	7.7 J
Magnesium	--	4,360 J	4,730 J
Manganese	--	31.2	29.2
Nickel	100	7.3 U	13.0 J
Potassium	--	804 J	1,040 J
Sodium	--	37,100 J	35,300
Zinc	--	14.8 J	38.4 U
Sulfide	--	200 J	1,000 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.

Table B-33
Analytes Detected in Groundwater Samples
Well KBA-11-21

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTE (µg/ℓ)			
Carbon disulfide	--	0.40 J	1 U
SEMIVOLATILE ANALYTES (µg/ℓ)			
Phenol	--	10 U	0.8 J
Diethylphthalate	--	10 U	0.5 J
Butylbenzylphthalate	100	10 U	0.6 J
bis(2-Ethylhexyl)phthalate	6	3 J	12
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	--	5,530 J	7,590
Antimony	6	3.2 J	3.0 U
Arsenic	50	2.3 J	7.1 J
Barium	2,000	211 J	198 J
Beryllium	4	1.3 J	2.0 U
Calcium	--	52,900	32,900
Chromium	100	15.4	16.5
Cobalt	--	1.7 J	9.0 U
Copper	13,000	4.4 J	5.7 UJ
Iron	--	7,230	9,610
Lead	15	2.0 U	3.4 J
Magnesium	--	23,600	17,800
Manganese	--	29.5	69.3
Potassium	--	2,290 J	1,610 J
Sodium	--	25,200 J	23,900
Vanadium	--	7.4 J	5.0 UJ
Zinc	--	31.7	43.8 U
Sulfide	--	400 J	3,000

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
-- = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.

Table B-34
Analytes Detected in Groundwater Samples
Well KBA-11-22A

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	4/94
VOLATILE ANALYTES (µg/ℓ)			
Carbon disulfide	–	0.50 J	1 U
Benzene	5	0.60 J	0.60 J
Chlorobenzene	–	1 U	4
1,4-Dichlorobenzene	75	1 U	5
SEMIVOLATILE ANALYTES (µg/ℓ)			
1,4-Dichlorobenzene	75	4 J	4 J
Naphthalene	–	0.60 J	0.8 J
Diethylphthalate	–	0.50 J	0.6 J
bis(2-Ethylhexyl)phthalate	6	1 J	8 J
INORGANIC ANALYTES (µg/ℓ)			
Aluminum	–	3,580 J	3,150 J
Arsenic	50	1.5 J	1.2 J
Barium	2,000	15.3 J	16.7 J
Calcium	–	45,800 J	32,900
Chromium	100	9.2 J	20.1
Cobalt	–	2.7 J	9.0 U
Copper	13,000	6.2 U	8.4 J
Iron	–	19,400 J	8,770
Lead	15	2.0 U	1.1 J
Magnesium	–	9,310	10,600
Manganese	–	256	129
Nickel	100	21.4 J	12.0 U
Potassium	–	12,200	11,800
Sodium	–	8,990 J	8,390
Vanadium	–	3.4 J	5.0 U

Notes: MCL = Maximum Contaminant Level.
µg/ℓ = microgram(s) per liter.
– = not applicable.
J = estimated value.
U = not detected.

Table B-35
Analytes Detected in Groundwater Samples
Well KBA-11-22B

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	1/94 DUPLICATE	4/94	4/94 DUPLICATE
VOLATILE ANALYTES (µg/ℓ)					
Carbon disulfide	--	2	4	2 U	2 U
Acetone	--	5 UR	5 UR	82 J	70 J
1,1-Dichloroethane	--	0.60 J	0.60 J	2 U	2 U
cis-1,2-Dichloroethene	70	19	20	18	17
Trichloroethene	5	0.50 J	0.50 J	2 U	2 U
Benzene	5	6	6	4	4
Chlorobenzene	--	1	1	2 U	2 U
Toluene	1,000	12	12	4	5
Ethylbenzene	700	54	56	44	45
Xylenes (total)	10,000	15	14	5	6
SEMIVOLATILE ANALYTES (µg/ℓ)					
4-Methylphenol	--	14	16	6 J	5 J
Dimethylphthalate	--	3 J	4 J	10 U	10 U
Diethylphthalate	--	10	11	8 J	8 J
bis(2-Ethylhexyl)phthalate	6	1 J	0.60 J	18	10 U
PESTICIDE AND PCB ANALYTES (µg/ℓ)					
gamma-BHC	0.2	0.050 UJ	0.050 UJ	0.072 J	0.056 J
Heptachlor	0.4	0.050 UJ	0.050 UJ	0.05 UJ	0.016 J
alpha-Chlordane	200	0.050 UJ	0.050 UJ	0.023 J	0.027 J
gamma-Chlordane	200	0.050 UJ	0.050 UJ	0.049 J	0.056 J
INORGANIC ANALYTES (µg/ℓ)					
Aluminum	--	1,770 J	1,580 J	450 J	396 J
Arsenic	50	2.8 J	2.6 J	1.5 J	1.4 J
Barium	2,000	29.6 J	28.1 J	25.7 J	25.4 J
Calcium	--	7,570 J	7,280 J	4,310 J	3,380 J
Chromium	100	5.5 J	5.6 J	9.1 J	8.8 J
Copper	13,000	13.4 J	4.7 U	11.5 J	5.4 J

See notes at end of table.

Table B-35 (continued)
Analytes Detected in Groundwater Samples
Well KBA-11-22B

Technical Memorandum
April 1994 Groundwater Sampling Event
Site 11, Old Camden County Landfill
Naval Submarine Base, Kings Bay, Georgia

	MCL	1/94	1/94 DUPLICATE	4/94	4/94 DUPLICATE
Iron	–	931 J	923 J	689	734
Lead	15	2.9 J	2.0 U	1.3 J	1.0 J
Magnesium	–	1,140 J	1,110 J	835 J	800 J
Manganese	–	13.2 J	12.8 J	12.1 J	11.2 J
Nickel	100	5.9 J	3.9 U	13.7 U	12.0 U
Potassium	–	19,100	19,000	17,200	17,300
Sodium	–	39,300 J	39,000 J	35,700	35,900
Vanadium	–	6.4 J	6.6 J	5.5 J	5.0 U
Zinc	–	51.6	49.2	41.3	38.4
Sulfide	–	2,200 J	2,000 J	1,000 U	1,000 U

Notes: MCL = Maximum Contaminant Level.
$\mu g/\ell$ = microgram(s) per liter.
– = not applicable.
J = estimated value.
U = not detected.
UJ = not detected, estimated quantitation limit.
UR = not detected, quantitation limit rejected because quality control criteria were not met.